CMP

IN THE LABS: E-Mail Antivirus Software p.77 ◆ RADWARE FireProof p.88

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APRIL 5, 1999

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SNEAK PREVIEWS

- Marimba Castanet 4.0 p.33
- Cisco Catalyst 2924M XL Fast Ethernet Switch p.36
- HiTecSoft WebConsole for NT p.40

Remote Access DREAM MACHINES

We tested 7 of the latest products and found that enterprise remote access finally means reliable, manageable solutions. See reviews starting on p.48

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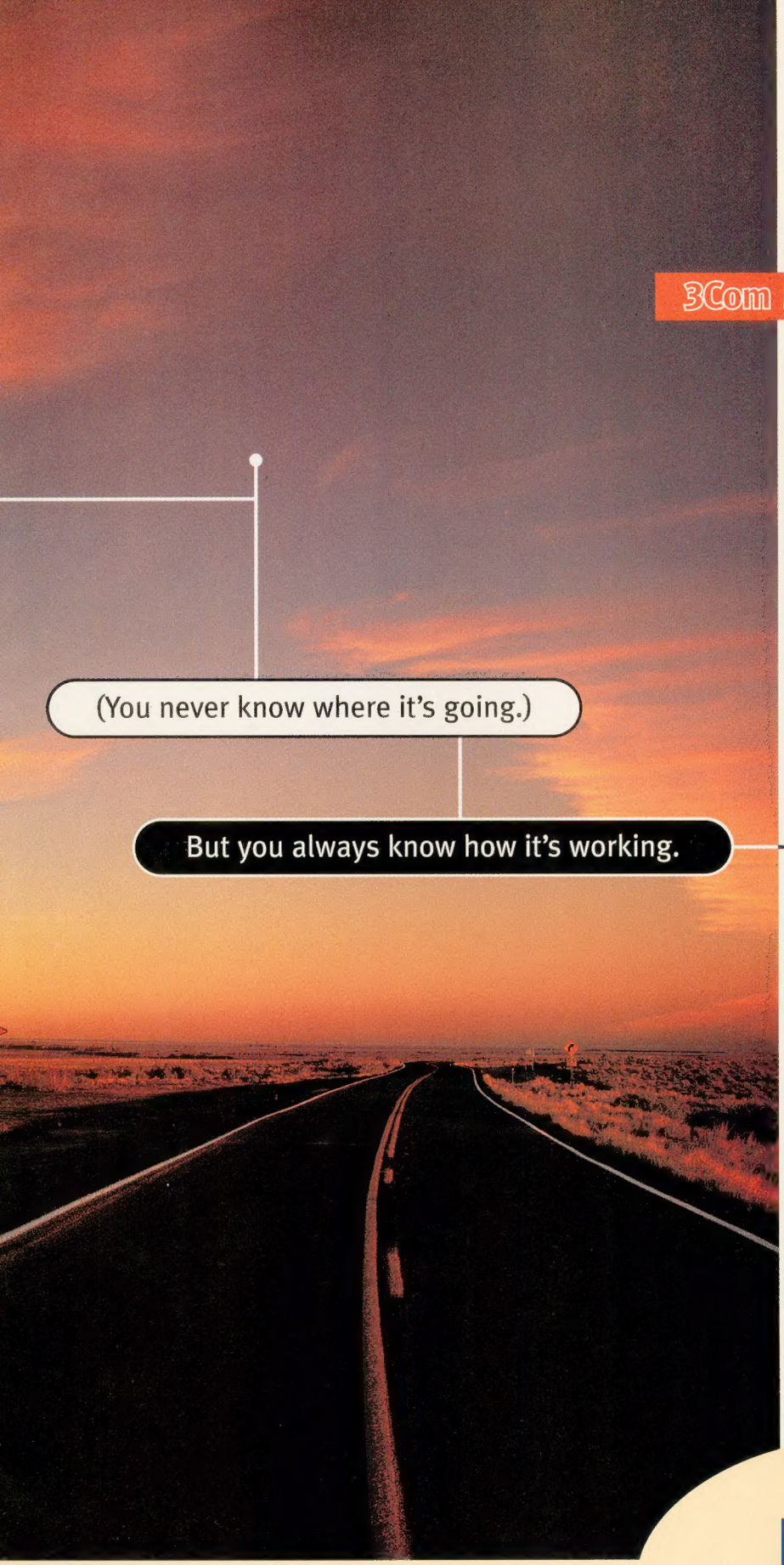

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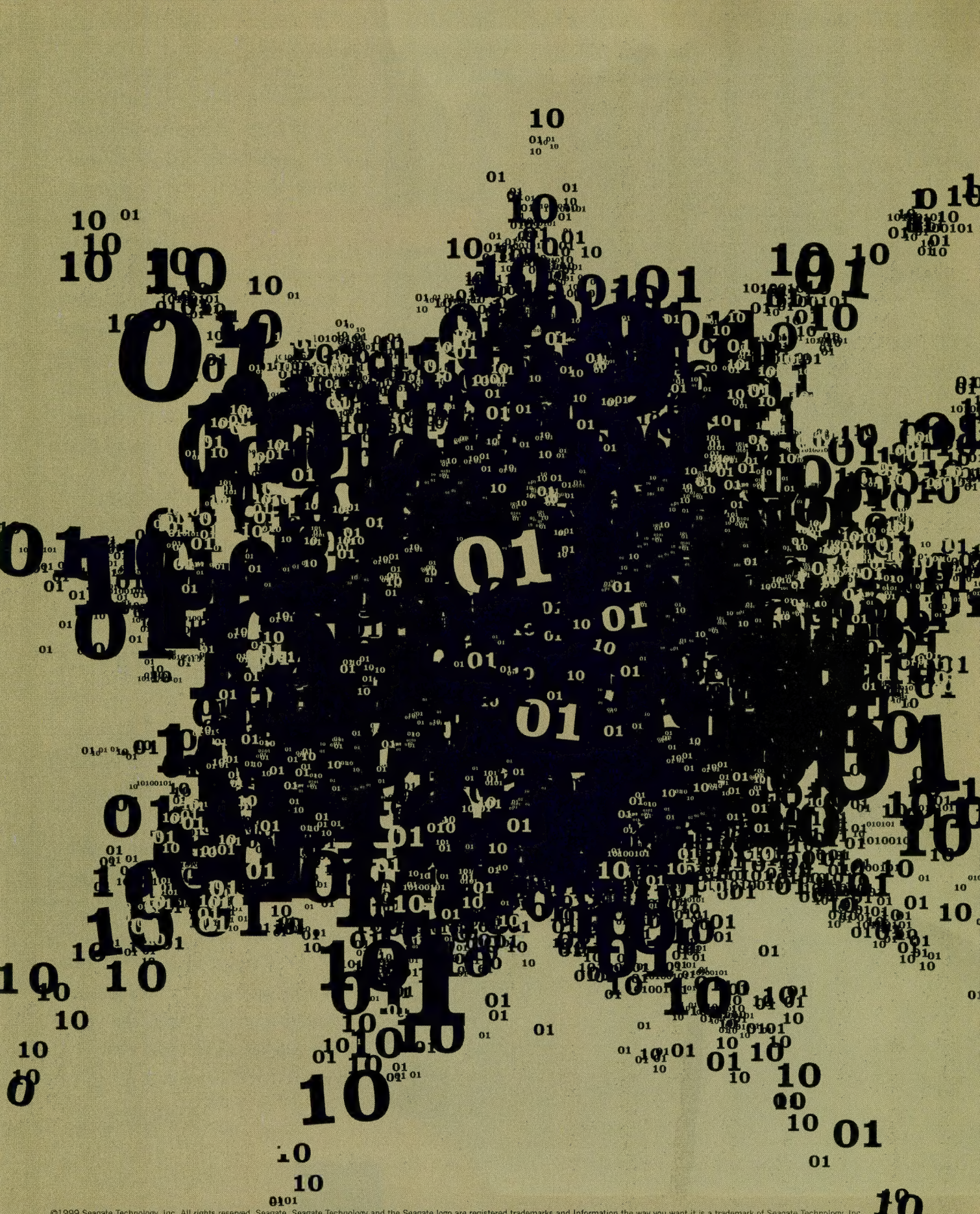

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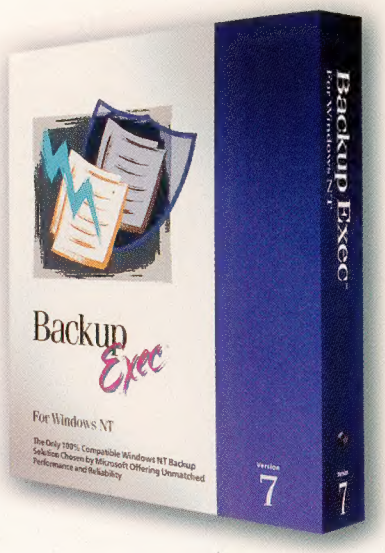
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NETWORK COMPUTING
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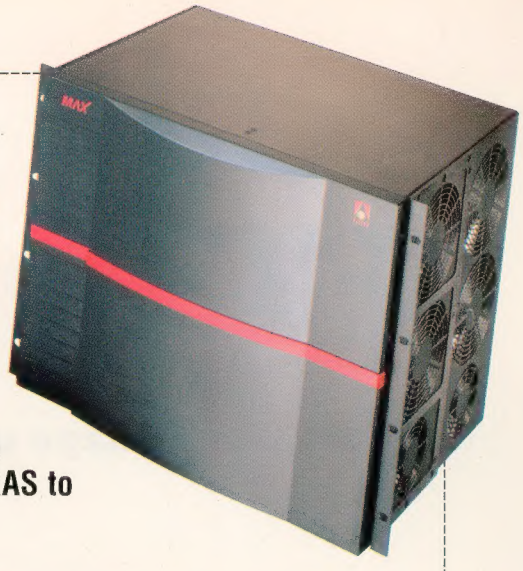
Vol. 10, No. 7 April 5, 1999



COVER STORY

Large-scale remote-access servers

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Have you virus-proofed your network?

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Now you can take our Interactive Buyer's Guide charts on the road with Adobe Acrobat PDF support. Try it out with our latest guide on 10-GB tape backup units at img.cmpnet.com/nc/1007/graphics/1007buyers.pdf.

Features

48 REMOTE ACCESS **Accessing the Enterprise: Large-Scale RAS to the Rescue**
by Mike Fratto
When it comes to enterprise-class remote-access servers, performance has become consistent, but management tools still vary widely in quality and functionality. We tested seven servers and their management tools, from Ascend, Cisco, Ericsson, Lucent, Multi-Tech, Shiva and 3Com. Ascend's MAX TNT earned top honors with its superb GUI and CLI management software and excellent reporting and debugging capabilities.

Reviews

77 SECURITY **Trend InterScan Secures Top Virus-Protection Spot**
by Jeffrey H. Rubin and Timothy M. O'Shea
Our tests of SMTP gateway antivirus products revealed that Trend Micro's InterScan VirusWall is by far the best option for keeping viruses off your network. InterScan is the only product we tested that can detect hostile applets—it also spotted malicious code embedded in VBScript, JavaScript, HTML, Access and PowerPoint files. Remember, however, that gateway antivirus products can only stop network-borne viruses, and none of the packages we tested had a 100-percent success rate.

88 FAULT TOLERANCE **RADWARE FireProof Balances Firewall Loads With Minimal Complexity**
by Gregory Yerxa
RADWARE's FireProof offers an intriguing nonproprietary solution for balancing the traffic loads among multiple firewalls. You get complete redundancy, along with a panoply of management capabilities that simplifies multiple firewall maintenance.

Workshops

98 OPERATING SYSTEMS **How To Implement SMB on Unix**
by Eric Hammond
If you're wrestling with the integration of Unix and Windows on your network for file and print access, you're not alone. Despite multiple options, the process is a challenge. We examine the pros and cons of running SMB on Unix, and focus on how you can use SAMBA to get the job done.

Continued on page 9

Online Extra

Take the inside track to corporate security with our latest Network Design Manual chapter on public key security at *www.networkcomputing.com/netdesign/1007pk.html*. And don't forget to take our public key quiz. You could win technical trade books!

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CENTERFOLD
Clermont County and Hamilton County Schools network
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Departments (Continued)

Centerfold

72 School System Broadcasts Video With ATM/LANE
by Kelly Jackson Higgins
To enable remote learning, you have to go the distance with broadcast video. We look at the new Southwest Ohio Regional Distance-Learning Network, an Ethernet and OC-3 ATM-based backbone using MPEG II compression.

Buyer's Guide

104 Get It on Tape: Backup That's Faster, Cheaper
by Dave Fetters
It may be time to blow the dust off your tape backup unit and re-evaluate your storage capacity, performance and reliability needs. We help you identify the best of today's smaller, faster and cheaper drives.

Online Extra Find the perfect high-capacity storage solution with our latest Interactive Buyer's Guide on 10-GB tape backup units at *www.networkcomputing.com/1007/1007buyers.html.*

Resources

NT1	Windows NT (after p.107)
114	Network Direct
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128A	Reader Subscription Card
135	Showcase
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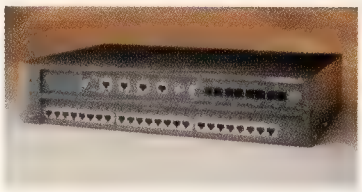
140, 141	Advertisers' Index
143	Editorial Index

Sneak Previews

33 SOFTWARE DISTRIBUTION Castanet Makes Application Distribution a Snap
by Ahmad Abualsamid
Marimba's latest version of Castanet software, its Internet Services Management solution, brims with new components that streamline software deployment for large organizations. We tested a beta version of Castanet 4.0 and liked its new Inventory and Subscription Managers, as well as its effortless integration with our browser. It also features multiplatform support, an easy-to-use interface and a flexible, multitier TCP/IP architecture.

36 INFRASTRUCTURE Cisco: More Ports for Network Storms
by Mark Degner



With more ports, better performance and enhanced management, Cisco's new 2924M XL switch provides impressive high-end connectivity. In our Netcom Systems' SmartBits-based tests, the 2924M XL was an ace performer—and managing the switch was a piece of cake with its simple, Web-based interface. The icing? The switch is priced at only $125 per port.

40 NETWORK MANAGEMENT WebConsole Aids NT Management
by Jay Milne
Trying to get a handle on NT management? We tested HiTecSoft Corp.'s WebConsole, a new NT management package. The application enhances your existing NTAdmin's functionality with convenient access to management components, and sports an HTML interface for use with administration tools. However, we think the vendor needs to implement some high-level security and multiple-server support before WebConsole is ready for the enterprise.

p.34 ActiveState Tool ActiveState PerlEx 1.1
p.36 Response Networks ResponseNet and ResponseWeb
p.38 Esker Corridor for Active Server
p.40 MicroData Group MELIA 2.0
p.42 Neon Software CyberGauge 2.0

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- "Mike, Is this you? This is Tommy, your cousin. Call or e-mail me immediately. Found a company who will build and host our site for FREE. If this is not you, Mike, I'm sorry if you received this by mistake." Technology editor David Willis responded: "And could you provide a free multilevel marketing pornspam delivery service that registers my site with search engines while erasing my bad credit history?"
- "SPANISH CEDAR CIGAR HUMIDORS! There is no need to respond to the above e-mail address to be removed. This is a one-time mailing." I received this at least six times one day.
- "Urging netizens everywhere to defend their data, the ACLU today launched a special Web site to focus public attention on the threat to personal privacy through the collection and widespread distribution of personal data." And how exactly did you get *my* e-mail address?
- "Dear Internet User: I'm tired of the porn e-mail and all that click-here crap. I've spent seven hours or more per day for the last two months researching the topic of spam on the Internet. I've learned a lot about SMTP blocking, reporting spam and blocking your e-mail account from being spammed. Please join me in fighting this horrible advertising. To order my detailed report and provide your help in fighting spam, send $15...." Metaspam. It came from K. C. Smith, whose e-mail address is *nonie619@aol.com,* in case any of you would like to follow up.
- And how about this one, from a D. Backman: "I was on the phone with [technology editor Mike] Fratto [who writes this issue's cover story on remote access, page 48], and after quickly discussing important stuff like certificate-authority vendors for an upcoming article, he 'had to bolt' because he was going to be late for 'yoga practice.'" Oops, that was a private message meant just for me.

READ THIS ISSUE NOW! First, we have a review of antivirus messaging systems (e-mail CONDOMS) on page 77. These PRODUCTS feature special SPAM filters, which is GREAT because we're tired of all this click-here crap. And don't forget to check out our CENTERFOLD (1-900-PAGE-72). If you wish to be removed from this list, turn the page!!

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It's Time To Spring Ahead—No Falling Back

Photograph by Vincent Colabella

Whether or not your local groundhog saw his or her shadow last month, spring has at last sprung. The president has been acquitted, the NBA lockout is now a memory, *BYTE* magazine has returned to the Web and NETWORK COMPUTING has reinvigorated UnixWorld Online.

In response to numerous requests, we've reopened UnixWorld, beginning with a tutorial on procmail by Unix guru Paul Dunne (*www.unixworld.com/017/107procm.html*). He will show you how to use this powerful local mail delivery agent to sort, generate custom autoresponders and log events based on message content. Along with our continuing coverage of Unix, you'll find updated Resource Guides on CGI, Java and the Web.

NETWORK COMPUTING Online has a few other bulbs in its garden. We've added a Network Design Manual chapter on digital certificates (*www.networkcomputing.com/netdesign/1007digcert.html*), with a wealth of information on certificate-based privacy and security, covering everything from network management to e-commerce. Our new Interactive Buyer's Guide on 10-GB tape backup lets you easily find the fastest, most interoperable and even most Y2K-compliant tape units available.

One of our brightest flowers blooming this spring is our forthcoming reader forum, Network Society.™ To join this influential group of technology users and buyers, visit *www.networkcomputing.com/forms/netsoc-signup.html*). As a member, you'll help drive the future direction of NETWORK COMPUTING and gain valuable insights from peers.

—*Bradley F. Shimmin*, bshimmin@nwc.com

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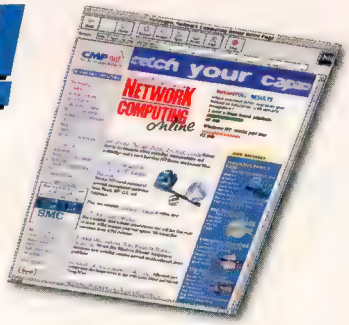

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"Politics and position jockeying just get in the way of running the network."

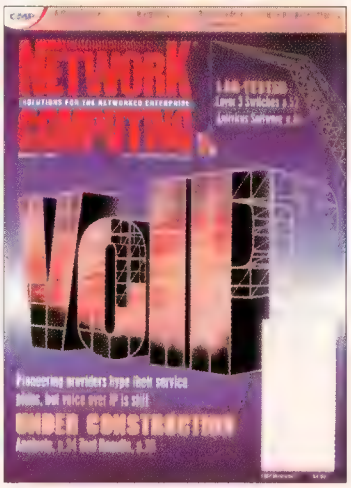
—MICHAEL KENNING, ST. JOHN'S HEALTH SYSTEMS

Treating Microsoft Unfairly?

Art Wittmann's characterization of Microsoft's response (unhelpful, uninterested, Pinto gas-tank problem and so on) seems quite unfair, not to mention embarrassingly faddish ("With Friends Like These...," March 8, page 140). Are you aware of the Microsoft Security Advisor? Through this mailing list and Web site, Microsoft provides objective assessments and fixes of security problems that the company is aware of, including the LAN Manager issue that was referred to in Wittmann's column. This can be found in Microsoft's April 1997 listing. Microsoft even promotes this service on its home page. You may find it listed under Subscribe: Privacy, Security & Safety.

Like anything else in life, software security is rarely a black-and-white, get-it-right kind of thing. There are tradeoffs among functionality, accessibility, ease-of-use, time and money. It's up to the user to determine how far he or she is willing to go.

JEREMY JOHNSON
IT Architect/Manager of Data Services
Ennis, Knupp & Associates
jjohnson@ennisknupp.com



Wittmann Sampler

Art Wittmann, I like your style. Are you the only technojournalist left who has integrity and is not tainted by free coffee mugs, keychains and beta software? Maybe you could be the Pied Piper for all those who lack the vision of technology and have been blinded by marketing hype. Thanks for maintaining your consistency.

SHAWN DOWNS
Director of Technology
PowerPath Systems
sdowns@powerpathsystems.com

Art Wittmann replies: *Thanks for the kind words. They certainly are great to hear. There are actually a few more folks around here who are as unbiased as I am—the other writers. But, in a way, I* am *biased—in favor of our readers. I spent a long time building information systems, and the scars from those experiences don't fade quickly. So it's fun to write about the industry from that perspective. Now I have to go hide my mug and T-shirt collection.*

Speaking From Experience: I Feel Your Blame

Dave Molta certainly did not write his column ("When in Doubt, Blame the Network," February 22, page 25) without first-hand knowledge! It is the epitome of our LAN/WAN, right down to the finger-pointing and heated e-mail. Unfortunately, not all managerial types will understand the necessary steps described to run things. Politics and position jockeying just get in the way of running the network. At least I know someone else out there knows what goes on.

MICHAEL KENNING
Network Systems Engineer
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Thanks to Dave Molta for his insightful column. I ran into a similar situation recently. We rolled out a new version of Norton Anti-Virus, the latest version of Client 32 and several system patches in preparation for our NetWare 5 upgrade. Within a couple of days the calls started coming in with complaints that the network was sluggish. Of course, the fingers started pointing at me. After several days of troubleshooting, I discovered that the new version of Norton Anti-Virus was spending too much time and system resources scanning for viruses. Our lower-end Pentium machines couldn't handle the

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strain. Luckily, the problem was fixed in a timely manner and we managed to make everyone happy. Thanks for the sound advice.

WALTER SHIVEL
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At one point while reading Dave Molta's column, I was convinced he was talking about our network at Spectrum Healthcare Services.

When our network migrated from shared hubs to Cisco switched hubs, we immediately saw a difference in performance. And shortly thereafter, we found our network crawling to a halt. We did our performance test, sniffer traces and a lot of praying. To make a long story short, Norton Anti-Virus 5.0 was implemented throughout our network and was the cause for the performance problems.

Molta is absolutely correct when he says that departments must work more closely together when implementing new projects to avoid issues such as these.

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Corrections

In his March 8 "What's Inside" column (page 12), Fritz Nelson states that Symantec did not participate in our antivirus comparison (*www.networkcomputing.com/1005/1005r2.html*). However, Symantec did participate in all facets of our testing. Network Associates did not participate because it was revamping its product line.

Our March 22 article on 802.11 devices ("Wired on Wireless: A New Class of 802.11 Devices Go the Distance") omitted our Report Card on DS PC Cards. You can find it online at *www.networkcomputing.com/1006/1006r2report1.html*.

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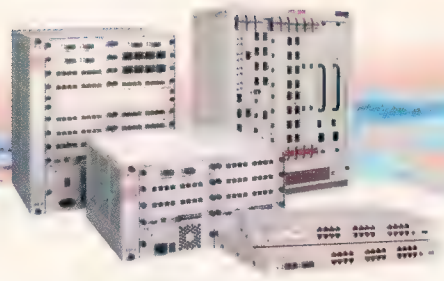

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Antivirus Protection: Have You Given Your Network Its Flu Shot?

If you believe the antivirus vendors, your enterprise is inundated with digital versions of Ebola, hemorrhagic fever and other such nastiness on a daily basis. To keep your network from resembling the pages of *The Burning Zone*, vendors offer automatically updated virus scanners for corporate desktops, file servers, messaging servers and firewalls. Are you using enterprisewide antivirus products or are you just hoping your network won't get the flu?

1. Does your company support enterprisewide antivirus products?

___ *Yes* ___ *No*

2. If your company does support enterprisewide antivirus products, where do these products reside?

___ *On each desktop* ___ *On key messaging servers*
___ *On each file server* ___ *At the firewall*

3. How many different antivirus products are in use on your network?

___ *One* ___ *More than three*
___ *Two or three*

4. *To protect your network from malicious Java and ActiveX applets coming off the Internet, do you limit your clients to locally signed applets?*

___ *Yes* ___ *No*

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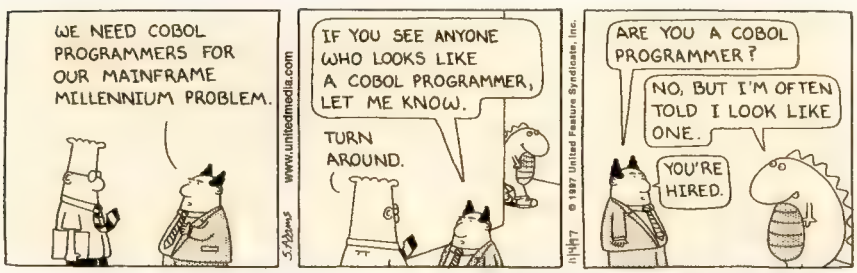
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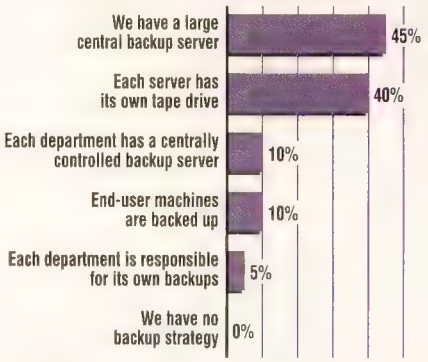
Backups Aren't Taking A Backseat

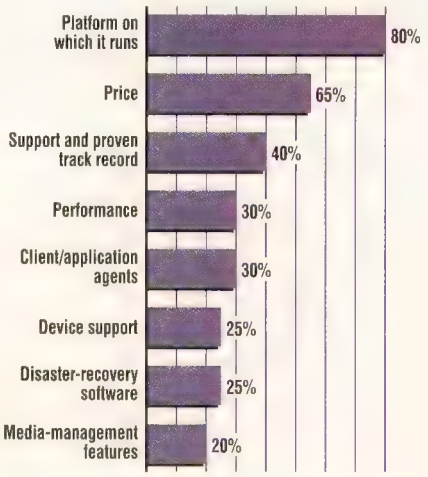
Not one response to our January 11 E-Mail Poll, "Backing Up To Move Ahead," included "We have no backup strategy" as an answer. That's good news for everyone who trusts that his or her data will always be there.

The two most popular backup server distribution schemes, registering 45 percent and 40 percent, respectively, are large central backup servers and server-specific tape drives. As for the top factors in selecting a backup server, the software platform clearly is most important (80 percent), but price is close behind at 65 percent. Finally, 4-mm DAT (digital audiotape) is your top choice for media, cited by 50 percent of you, but 8 mm also scored high at 45 percent.

1. How are your backup servers distributed?



2. Which factors helped you choose your backup server software?



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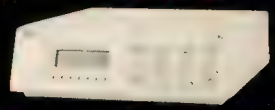

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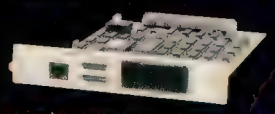

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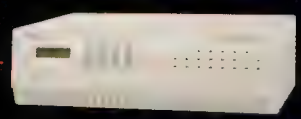

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XML: Revenge of the Nerds

Application development lags behind the explosive growth all around it. Is there a glimmer of hope? And is it spelled XML?

Despite the enabling nature of open networks and the explosion of Internet users and uses, the pace of application development has been decidedly slow. It's not much easier to develop an enterprise-class application now than it was 10

years ago, and there's little reason to believe that's going to change any time soon. It's hard to imagine drawing a geometric line on a chart and calling it "IT Productivity Gains" without provoking belly laughs.

The reality is that most interorganization data-sharing projects begin with two pasty-faced men arguing about how many fields are in a mailing address. Then an overworked, underimaginative project manager asks for five times more documentation than the underlying code will ever require. (I get to say those things because at times, I've been both.)

For years we have heard about the critical, cutting-edge standards that are shaping the networking world. IPSec, IPv6, OSPF and LDAP have received lots of ink in the press and plenty of mindshare from the vendor community. This attention to emerging protocol standards leaves 99 percent of all enterprise IT departments wondering what's in it for them and what difference any emerging standard will have on the systems they are planning to build. Obviously, the enterprise benefits as new protocols come online and drive down cost of ownership, maximize scalability, increase security and improve management. However, there is very little in the protocol development and implementation lifestyle in which the enterprise can participate. Usually it boils down to a vague sense of "This product was brought to you by Protocol X."

There's a Shift Ahead That, at least, is changing for the better. Last month in this space I bemoaned the lack of true Internet-based shopping protocols and warned that merely paying for goods on the Web does not a digital economy make. The future of e-commerce will depend upon protocols such as IOTP (Internet Open Trading Protocol). Let's step back for a second and examine the foundation on which IOTP is based—XML (Extensible Markup Language)—and what it means to you.

Whether open or proprietary, protocols traditionally have been excellent at delivering arbitrary payloads of user data and always will be; there is no real room for innovation here. The ascension of IPv5 was at the expense of OSI, as was proven by IPv6. Alternatively, specialized protocols have transcended expectations of solving a particular problem—take SNMP and network management.

One basic problem is that there is no way to describe the user payload. SQL and ODBC are as close as conventional development has come. SQL is great. It has proved that most, if not all, business problems can be described in a relational database. However, we still don't see organizations exchanging schemas in anything approaching a timely fashion. So while the relational algebra is sound and ODBC has smoothed over many problems with client programming, knowledge of the actual schema and any type of security context is completely missing from conventional development.

Until now, there have been only two alternatives to SQL: The first is ad hoc record layouts (the old reliable delimited, or fixed-length, layouts). The problem with ad hoc conventions is that they are not self-documenting, and they rely on the organizational memory of the project team that created them. Neither characteristic promotes data sharing among organizations, as the demand for shared data becomes greater than ever. The other alternative is a formal grammar based on ASN.1 (Abstract Syntax Notation). ASN provides a universal data exchange language and has been the basis for DCE RPCs and SNMP content for years. However, it has been completely ignored as part of the application development toolkit. It is simply beyond the ability of mainstream developers and has been ignored by tool vendors.

ASN seems destined to remain an embedded data exchange tool used exclusively by vendors. But just as routers and switches have a requirement to exchange specific information about configuration and status without a priori knowl-

Photograph by Jim Piper

edge of who will be receiving and acting on that information, the Internet and expectations of networked businesses demand that the enterprise has the same requirements to exchange information without reinventing the wheel each time.

XML is the logical candidate for intercompany data exchange. And you need to develop the expertise in-house to implement it. We simply cannot afford the ongoing overhead and delays of big efforts such as EDI, and the inflexibility and lack of added value for conventional import/export data flows.

There are two reasons XML should be your default data format: It's not as difficult as you think it is, and it is the best alternative available that "future-proofs" and "partner-proofs" your data. XML does this by building on HTML.

All in the Family HTML and XML share a common intellectual ancestor in SGML (Standard Graphical Markup Language). In fact, a basic XML document is not much different from an HTML document, albeit with very strict grammar. Unlike the intricacies of ASN.1, if you can comprehend HTML, you can comprehend XML. Like HTML, all XML documents are text-based and can be easily manipulated by any of the applications you know and love.

Like HTML, XML takes advantage of the underlying protocol layers for transport, reliability and security. However, besides expanding on HTML's ability to format and publish information for display, XML has been designed for extensibility, which can be used to develop data structures of arbitrary complexity; document databases, astronomical instruments and push channels all can be defined using XML. The time for thousands of enterprisewide import/export applications has come and gone.

Let's return for a moment to the concept of shopping protocols for e-commerce. The problem is how to describe precisely the entities involved: the product, the consumer, the vendor, and the terms and conditions. Moreover, if you want to compare product documents from two sources, how would you accurately perform the comparison on the multiple variables that describe the product?

If the Web can publish price descriptions on any potential product and XML can provide the accompanying structure, then RDF (Resource Description Framework) guides you on how to automate the communication of that data between e-commerce sellers, buyers and everyone in the middle. By definition, an XML document is self-describing and self-validating, as XML's DTDs (Document Type Descriptions) provide the specific type of information needed to parse the enclosed information. By describing XML data with Class and subClassOf tags, the RDF provides the mechanism to map the data directly to an object-oriented language such as Java, C++ or (heaven forbid) Visual Basic.

An e-commerce provider can thereby publish its catalog in explicit, deterministic format that can be queried and compared with that of other suppliers. When combined with explicit digital signatures and time stamping, XML provides the technology that is the crux of implementing a networkwide trading system.

While sites like *biddersedge.com* have started to collect, parse and present sale information from multiple auction sites, they have to rely on parsing HTML intended for presentation, not for data exchange. It would make the job a lot easier if all auction sites published in XML.

Finally, the most fascinating and hopeful thing about XML is that it has been used for advanced applications: NASA uses it to remotely control and harvest data from telescopes and deep-space cameras in the South Pole and mounted in Boeing 747s. And it has also been used to catalog the database of RFC documents. In fact, Marshal Rose, chief of protocol at Invisible Worlds, wrote an Internet Draft describing how to use XML's DTD to write Internet drafts and RFCs. At the same time XML is within the range of the rank-and-file programmer. Witness Ed Tittel's *XML for Dummies* book, which illustrates exactly how approachable XML is for average folks, and contains more useful information on XML than its title implies.

NASA uses XML to remotely control and harvest data from telescopes and deep-space cameras in the South Pole and mounted on Boeing 747s.

XML is no longer a bleeding-edge technology. The browser you are using today supports it. Vendors from Allaire to webMethods support it. Major database companies, including Oracle, Sybase and Informix are now aware that XML is more than a blip on the radar screen. Expect products from them to publish the results of queries as XML and import XML into their tables.

In the words of Rose, "In the '80s, RFC 822 was the universal data exchange language. In the '90s, we took a step sideways with ASN.1. But now it looks like XML will be the data representation language for the next millennium." ■

Brian Walsh is the founder of bwalsh.com, a Portland, Ore., consulting firm specializing in Internet and client/server product strategies, development and testing. Send your comments on this column to him at brian@bwalsh.com.

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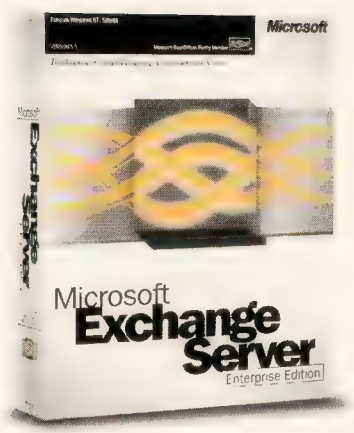

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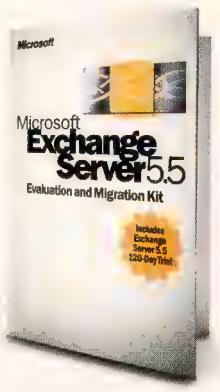

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Castanet Makes App Distribution a Snap

BY AHMAD ABUALSAMID

Software management and distribution is one of the biggest problems facing both network administrators and software vendors. Most vendors use CDs to distribute their software, but this isn't very efficient: Administrators in large organizations must deploy the software on multiple servers and possibly hundreds of client computers, and that takes time.

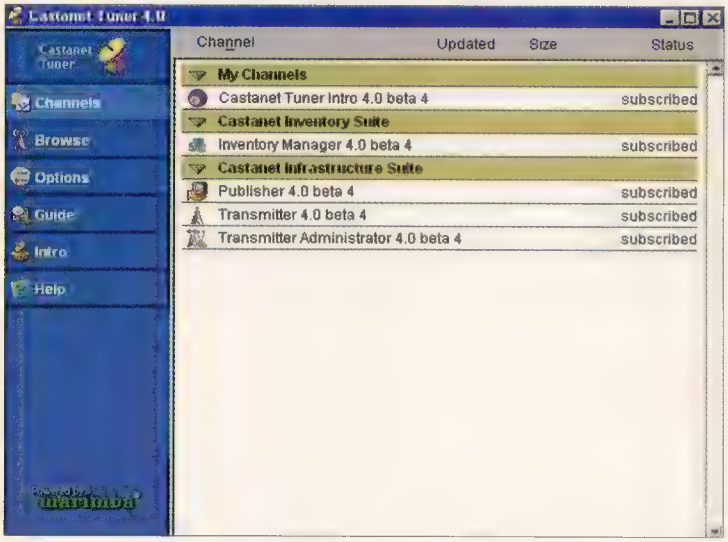
Given the Internet boom, software vendors are shifting to Web distribution. However, once an application is downloaded, it still must be installed—a process that can't be automated without additional software. Marimba's Castanet, an Internet Services Management (ISM) solution, gives network administrators a hand by automatically distributing and staging applications.

This improved product is clearly ahead of its competition with its multiplatform support; flexible, multitier TCP/IP architecture; easy-to-use interface; and browser integration. I tested a beta version of Castanet 4.0, which is full of new components that streamline software deployment for large organizations, such as Inventory Manager and Subscription Manager.

On top of its vast functionality, Castanet 4.0 significantly reduces deployment and support costs. More uniform client computers on your network minimize potential errors by eliminating manual configurations. Starting at $10,000, Castanet is reasonably priced for handling enterprise deployment issues. It's available for Windows95/98, Windows NT 4.0, Hewlett-Packard Co. HP-UX, IBM Corp. AIX and Sun Microsystems Solaris systems.

Multilevel Management Castanet's architecture is comprised of client software (Tuner), server software (Transmitter) and a network transport (HTTP over TCP/IP). I began testing Castanet by downloading and installing Tuner on my Windows NT Server 4.0-based computer. Tuner let me download and install the rest of the Castanet application suite, including Inventory Manager and Subscription Manager. Once I selected a specific Channel (Marimba's term for applications and data), the Tuner simply downloaded and installed it. It doesn't get any easier than that.

Testing Castanet's new browser-integration module was a breeze. Although Tuner has an easy-to-use interface, the browser interface is more intuitive. When I visited the Marimba site prior to installing the software, I only saw small HTML files that had no useful content. After I installed the Castanet browser integration module, my browser recognized the same HTML files as Castanet Channels.



Using Marimba's Castanet Tuner, updates are as simple as point and click.

Another significant addition to Castanet 4.0 is its new Inventory Manager. This addition communicates with a back-end relational database via JDBC (Java Database Connectivity) to store and search inventory information, as well as generate reports. An inventory agent runs on the client machine, gathering information about in-

In This Section

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HiTecSoft WebConsole for NT 40

FAST & FURIOUS

Spotlighted here are ActiveState Tool ActiveState PerlEx 1.1., Response Networks ResponseNet and ResponseWeb, Esker Corridor for Active Server, MicroData Group MELIA 2.0 and Neon Software CyberGauge 2.0.

stalled software and hardware, the operating system and available network information. The information is then sent back to the inventory server according to a prescribed schedule. This gives the Inventory Manager a near real-time view of the current status of your clients. If, for example, an IT shop decides to roll out Word 2000 to PC users running Office97, Inventory Manager can generate a report of these users with ease. Inventory Manager requires Oracle8.

Subscription Manager let me specify groups of channels to which a particular user subscribes, and the software on his or her machine was updated automatically in the background. I installed the Subscription Service, a Castanet Channel with no user interface, on the clients. On the server side, I installed Subscription Manager and specified that I wanted to use Subscription Transmitter. In no time at all, I was able to control the updates taking place on my clients.

Although I manually entered the users' names into Subscription Manager, this component also lets you import users' information via an LDAP server, NT directory service or other common directory service. Microsoft Corp.'s SMS lets you perform similar tasks, but I found Subscription Manager's architecture more flexible; the Internet is the only connection between Transmitter, Subscription Manager and Subscription Service, so you can install Subscription Manager across geographically diverse areas.

Remote, unattended installations sound appealing, but can be a headache without proper security. Castanet provides both authentication and authorization, and uses SSL (Secure Sockets Layer) encryption techniques for the downloaded channels. (You will need to purchase and install a certificate on your machine that runs Tuner.) For authorization, you can set up users and groups that have access to administration functions. Again, I chose to set up the users manually, but you can obtain the information from a directory server. Next, I assigned the proper authorization to administer the Transmitter.

Marimba should consider integrating DMI (Desktop Management Interface) and other DMTF (Desktop Management Task Force) initiatives. This would enable the software to collect data transparently from DMI-enabled computers. ■

Ahmad Abualsamid is a senior partner with 1Internet Corp., Chicago. Send your comments on this article to him at ahmad@execpc.com.

[If an IT shop decides to roll out Word 2000 to PC users running Office97, Inventory Manager can generate a report of these users with ease.]

Vendor Information

Castanet 4.0, starts at $10,000. Available: Now. Marimba, (650) 930-5282; fax (650) 930-5600. *sales-corp@marimba.com* or *www.marimba.com.*

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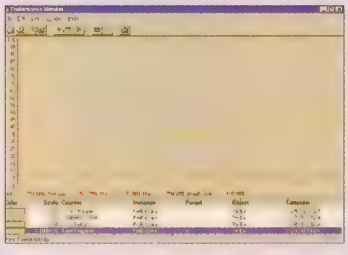

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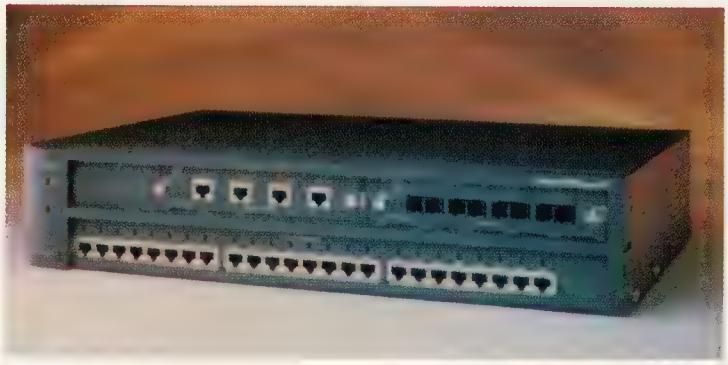
Cisco: More Ports for Network Storms

BY MARK DEGNER

Cisco Systems has enhanced its already solid Catalyst 2916M XL with additional ports and functionality to create the Catalyst 2924M XL. This 24-port, autosensing 10/100 TX Ethernet switch is fast, flexible and easy to manage. Its flexibility stems from two module slots that accommodate either a four-port 10/100 TX module or a 100BASE-FX fiber module.



Cisco's 2924M XL, a 24-port autosensing 10/100 TX Ethernet switch, is fast, flexible and manageable—true assets for reliable network infrastructure.

The 2924M XL was an ace performer during our Netcom Systems' SmartBits-based tests. Managing the switch is child's play, thanks to a simple, Web-based interface. The icing on the cake is the 2924M XL's competitive price: At $125 a port, it's an ideal choice for high-speed, end-station connectivity or for aggregating 10/100-Mbps workgroups.

The 2924M XL is available in two software configurations: standard and enterprise. Aside from the enterprise edition's extensions to the switch's IOS (Internetworking Operating System) software—which provide industry-standard 802.1Q and Cisco's proprietary ISL VLAN (virtual LAN) trunking support—these editions share the same basic features. The switch's modularity is great for growing networks. As of press time, Cisco offers Fast Ethernet modules with ISL/802.1Q capabilities and a gigabit module. An ATM module is scheduled to ship this month.

Blasted by SmartBits Using SmartBits, I tested the 2924M XL with 12 streams of wire-speed Fast Ethernet traffic. By connecting it to the 24 ports, I configured 12 pairs of ports with a stream of wire-speed traffic. One port on SmartBits transmit-

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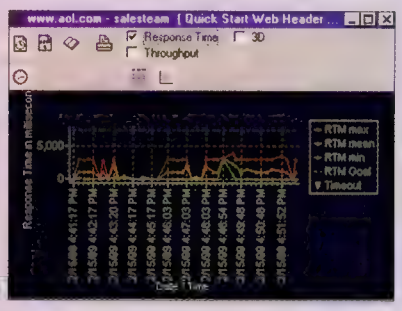

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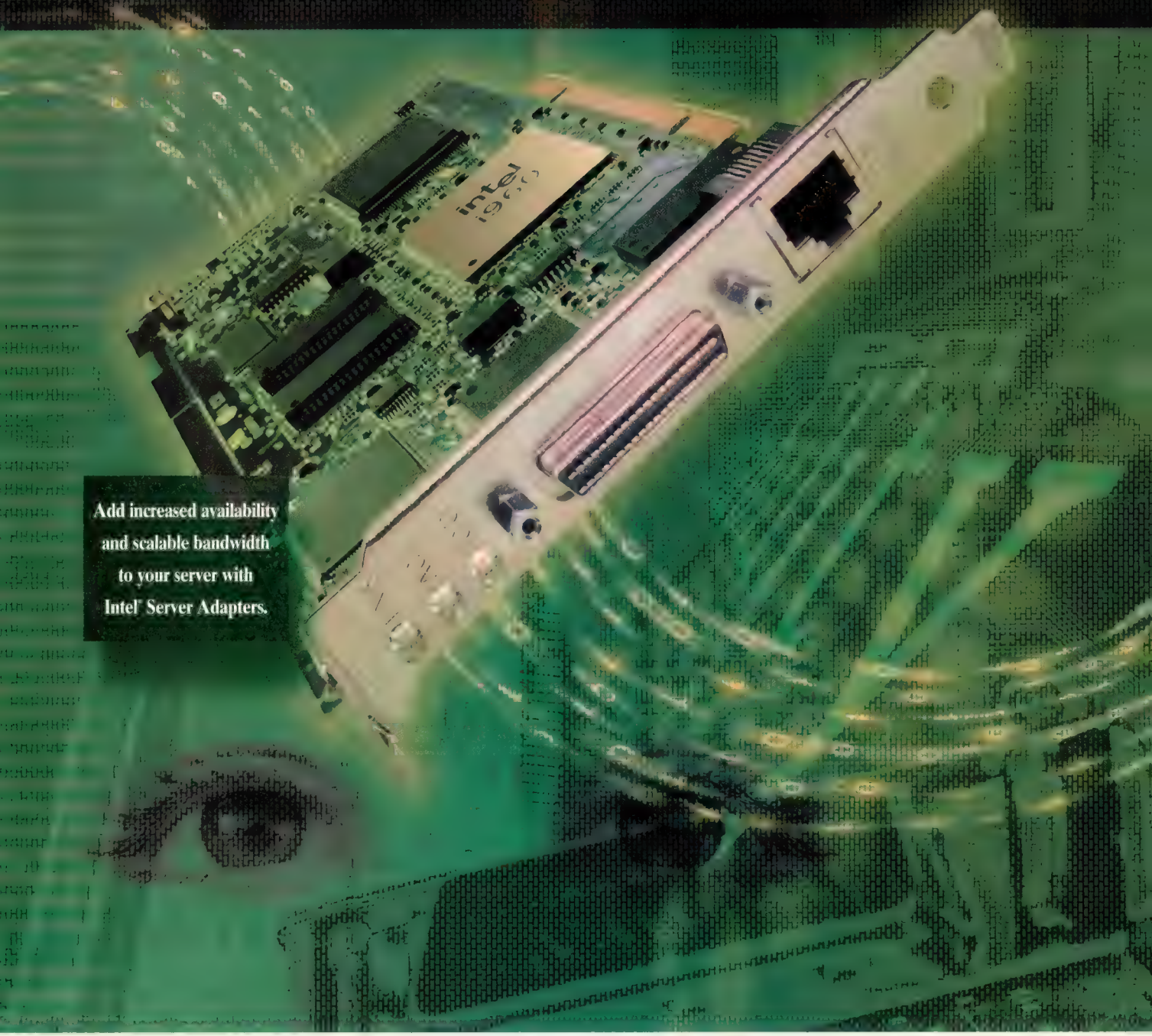

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ted the traffic, while another port received the traffic. The SmartBits hardware benchmarked the tests, while Netcom Systems' SmartApplications tabulated the results. The 2924M XL lived up to the same high standards as the 2916M XL, performing flawlessly under a battery of SmartBits tests, including throughput, packet loss and back-to-back packet transmission.

The 2924M XL's management is available in two forms: via the familiar Cisco IOS command-line interface and the switch's built-in Web-based management utility, a relatively new implementation venture for Cisco hardware. Each method demonstrated its strengths and weaknesses during our testing. The IOS's interface is a very powerful configuration method, with relatively complex cryptic commands. In contrast, the Web-based management provides a graphical interface to the switch's features, and clearly lays out the switch's configuration. Configuring the switch was intuitive, but be sure to save the configuration—if you don't, your changes will be lost when you restart the switch.

Mystical Fast EtherChannel Intrigued and unsatisfied with the Fast EtherChannel (FEC) test I had performed on the 2916X ML, (see "Cisco Raises Stakes in Fast Ethernet Switching," *www.networkcomputing.com/902/902sp2.html*), I wanted to see how much traffic the 2924M XL's Fast EtherChannel link could handle. (Fast EtherChannel is a proprietary Cisco technology for aggregating traffic over two to four physical links. Theoretically, the combined bandwidth is cumulative, giving you a possible 800 megabits of full-duplex bandwidth between two Fast EtherChannel devices.) To the 2924M XL's credit, I was unable to generate enough traffic to saturate the FEC link.

After configuring a four-port Fast EtherChannel between the 2924M XL and a non-modular 2924, I was left with 20 available ports on the 2924. Using Cubix ERS/FT II high-density servers running Windows NT Workstation and Ganymede Software's Chariot performance benchmarking suite, I attached 40 servers to these two switches. Twenty stations were connected to a fixed-configuration Catalyst 2924, with the other 20 on the 2924M XL. Servers on either side of the FEC link interoperated during this transmission. Ten streams of traffic were transmitted in one direction, along with 10 streams in the opposite direction. At the fastest transmission rate, I generated approximately 36 Mbps of traffic between each pair of servers, for a total of 720 Mbps across the Fast EtherChannel trunk. With an advertised maximum throughput of 800-Mbps full-duplex, this trunk proved itself able to handle all the traffic I could throw at it—and then some. ■

Mark Degner is a consultant for Greenwich Group Solutions, Chicago. Send your comments on this article to him at mdegner@usa.net.

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Vendor Information

Catalyst 2924M XL 10/100 Autosensing Fast Ethernet Switch, $2,995 for standard edition and $3,495 for enterprise edition. Available: Now. Cisco Systems, (800) 553-6387, (408) 526-4000; fax (408) 526-4100. *www.cisco.com*

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WebConsole Aids NT Management

BY JAY MILNE

Managing a Microsoft Windows NT environment requires easy access to the right tools. One of the newest NT management packages, HiTecSoft Corp.'s WebConsole for NT, expands NTAdmin's functionality (included in Microsoft's resource kit), offering convenient access to User Manager and Domain Manager, as well as an HTML interface for Event Viewer, User Manager and other administration tools. WebConsole also supplies a supplemental remote-control utility.

Unfortunately, when I tested WebConsole, it produced several Active Server Page (ASP) errors. It's a single-server-oriented product, so I couldn't manage or view information on multiple servers simultaneously. HiTecSoft needs to add this support before WebConsole can be considered a true enterprise product.

HiTecSoft Corp.'s WebConsole gives you access to all the tools you need to manage Windows NT, but its features are not as comprehensive as we might have liked.

Similarly, WebConsole does not provide security facilities (only a basic login screen), another must for the enterprise. At the very least, you should use SSL (Secure Sockets Layer), and if you plan to run WebConsole over the Internet—a practice we don't recommend—consider installing client digitial certificates for added authentication.

If you're on a tight budget and you're satisifed with Microsoft's resource kit, WebConsole may not justify its cost ($1,995 for three servers). You should test WebConsole extensively before deploying it. It has an easy-to-use interface for managing NT servers, supports NT and NetWare—a plus for mixed networks—and requires Microsoft's Internet Information Server (IIS) 3.x or later.

Easy Access I installed WebConsole on a Dell PowerEdge Pentium Pro with 256 MB of RAM, and the application barely taxed the server's CPU. Performance on the local network was acceptable and similar to native NT tools. I also tested WebConsole remotely, and its performance

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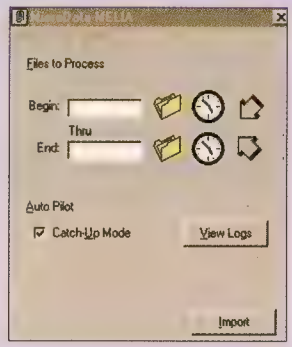

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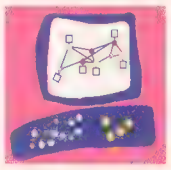

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over a 28.8-Kbps dial-up connection was adequate. Unfortunately, I was unable to compare user administration performance for my 1,000-plus user IDs—WebConsole consistently generated ASP errors when I attempted to list the IDs. HiTecSoft says this is an IIS problem and was awaiting a solution from Microsoft as of press time.

The user administration ASP error was only one of several miscues that I encountered during testing. At one point, I was unable to log into WebConsole, which forced a server reboot. As a side effect of the ASP errors, the test server continued to request data from the PDC (Primary Domain Controller), consuming approximately five percent of our 100-Mbps network. After I rebooted the server, the problem disappeared. HiTecSoft attributes this problem to IIS, too. Regardless, it severely impacts WebConsole's functionality and stability. The company should consider adding support for other HTTP servers, such as Netscape Communications Corp.'s Navigator; it did not have any such plans at press time.

Once WebConsole ran smoothly, it gave me easy-to-use access to approximately 80 percent of standard NT administrator functions. I was able to view the event log of our three test servers—one PDC, one BDC (Backup Domain Controller) and one server—without any difficulty. I also used the WebConsole's Java-based performance-monitoring tool to view memory usage and CPU utilization. I liked having the ability to change the refresh rate, but was frustrated by the limited selection of monitoring parameters. HiTechSoft says it will be adding other parameters in a future version.

As an alternative to WebConsole's HTML interface, this package includes a remote-control utility that's an OEM version of Stac's ReachOut. In the lab, this program was just as fast as Symantec Corp.'s pcANYWHERE, and I didn't encounter any problems managing my NT 4.0 server. The utility also supports Windows95/98.

WebConsole provides a reporting mechanism, but it is not interactive and a few of our reports did not function properly. According to HiTecSoft, a future version of WebConsole will incorporate enhanced reporting and interactive capabilities.

Other plans include an alerting feature, which will display a pop-up window when a particular event occurs or a monitored threshold, such as CPU utilization or memory usage, is reached. By enabling alerts, WebConsole would extend its functionality beyond an information pull-based application.

Much To Be Desired While WebConsole enables access to information about the NT machines on your network, it lacks some key functionality. I would have liked to have had the ability to view network configuration, including IP addresses of individual network adapters and a list of installed protocols, as well as the ability to modify network settings. WebConsole also lacks remote diagnostic facilities; I missed having the ability to run nbtstat, view or ping utilities from the program.

HiTecSoft also should add a mechanism that lets you view failed login attempts and suspend a user's account if it reaches a preset number of them.

One of NT's major holes is its lack of granular administration, which WebConsole does not address. You'll have to look into other third-party products for this capability. ■

Send your comments on this article to Jay Milne at jmilne@nwc.com.

Vendor Information

WebConsole for NT, $1,995 for three server licenses. Available: Now. HiTecSoft Corp., (888) 970-1025, (602) 970-1025; fax (602) 970-6323. *sales@hitecsoft.com or www.hitecsoft.com/html/webconsolent.*

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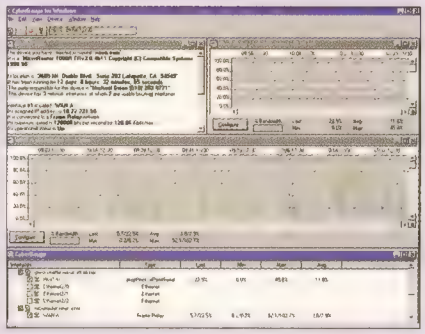

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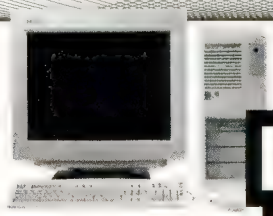

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Accessing the Enterprise:
LARGE-SCALE RESCUE

By Mike Fratto

It's easy enough to find a remote-access server for a small office, but finding the right one for a large organization isn't so simple. Sure, you can outsource remote access, but most companies—large and small—still purchase and manage their remote-access services. What makes enterprise remote access so different from that for branch offices and home offices? Three things: Management, port density and features.

We tested seven large-scale remote-access servers (RAS): Ascend Communications' MAX TNT, Cisco Systems' AS5300, Ericsson's Tigris 7-Slot, Lucent Technologies' PortMaster 4, Multi-Tech Systems' CommPlete, Shiva Corp.'s LanRover Access Switch Dual Power Supply (LRAS DPS) and 3Com Corp.'s Total Control Multiservice Access Platform with HiPer Access System. No-shows included Compaq Computer Corp., which bought Microcom last year and said it didn't have a product ready in time for our tests; Nortel Networks, which purchased Bay Networks and backed out at the last moment, claiming a lack of resources; and RASCom, which said its products don't fit the enterprise because they all lack SNMP support.

With an average of eight users per port, most of these units can handle as many as 192 users with one T1 line, though the actual number of modems supported ranged from 72 to 864. That's large enough for most branch offices. The enterprise running a central site typically consists of up to eight T1s and 184 modems. We tested single and multiunit RASes with port counts ranging from 72 to 864 modems.

Much has changed since our last remote-access tests, conducted about a year ago (see "Smokin' Remote Access Pushed to the Max," at *www.networkcomputing.com/822/822r1.html*). Both hardware performance and management consoles have improved, almost across the board. Performance, an issue that once separated the haves from the have-nots, has both improved and evened out for all products. In our tests, throughput and call handling were remarkably consistent regardless of the RAS. We should note that for our 184-modem test bed, the Cisco AS5300, Multi-Tech CommPlete and Shiva LRAS ran at maximum port counts, while the Ericsson Tigris, Ascend MAX, Lucent PortMaster 4 and 3Com Total Control

Photography: Goldman Studios

RAS TO THE

systems were nowhere near full capacity.

On the other hand, while all the management consoles have improved, their features and capabilities still vary. GUIs and CLIs (command-line interfaces) offer management perspectives for both the line technician and the service desk. Both interfaces have become easier to use. In fact, the Cisco, 3Com and Ascend CLIs have many new features, including command history, command completion and context-sensitive syntax help, that make them simpler than ever to use.

Most of the management systems in this group are adequate for the job, but the more users there are, the more complicated server and user management issues become. Vendors offer some help with custom applications that provide the framework for reporting and managing integration into existing network services, such as RADIUS (Remote Authentication Dial-in User Service), SNMP platforms and syslog. For larger enterprises, such integration is critical. Fortunately, it's also getting better. We had to do little configuration to achieve basic connectivity. Using Funk Software's Steel-Belted Radius, Castle Rock Computing's SNMPc and a Linux workstation for syslog, typical configurations required only setting the IP address and pointing the servers to the appropriate services. We also could set up backup services.

However, minimizing downtime in the event of a failure—which costs money in terms of lost productivity—requires more than just backup services. Redundancy is key. Every server we tested had redundant power supplies and support for redundant servers. Of course, the RAS will have to come down for service at times. We expected some downtime for firmware and software upgrades, but we were disappointed that Multi-Tech's and Shiva's RASes required system resets after configuration changes.

Executive Summary

Enterprise remote access finally means reliable, manageable solutions ready to serve users. As performance variations have diminished over the years, the major difference in these systems lies with management for both line technicians and network administrators.

Our results showed that these products satisfy different needs. For scalability beyond eight T1/PRIs, the Ascend MAX TNT (our Editor's Choice), Ericsson Tigris, Lucent Portmaster 4 and 3Com Total Control system offer high port counts and relatively robust management. Sites that don't need more than eight T1/PRIs should consider the Cisco AS5300, Multi-Tech CommPlete and Shiva LanRover Access Switch DPS.

Management functionality must satisfy the technician who uses the CLI (command-line interface) and the network administrator who may prefer a GUI or network management station. Improvements in the CLI indicate that's where many configuration changes are made. Often, it's quicker to type a few commands than to navigate a GUI; in many cases, the GUI offers fewer configuration options than the CLI. However, access to the CLI may be inaccessible from some places, so GUI management plays an important role.

Reporting comes through RADIUS accounting, SNMP traps and syslog. The administrators are responsible for parsing the data into meaningful information. A few management platforms, notably Ascend's NavisAccess and Multi-Tech's MultiCommManager Statistical Analyzer, provide canned reports, which can be invaluable time-savers.

Picking a Winner To select the best RAS, we looked for strong management applications that would work for everyone—the line technician who configures and troubleshoots the RAS, the network administrator who requires reporting at the line level, and upper management. Strong debugging features, including user PPP tracing, and other system tools are also valuable. Performance, while still an issue for remote access, is not just about throughput: Manageability is important as well. No vendor did poorly on the management side, which attests to the maturity of products in this market.

Ascend's MAX TNT took our Editor's Choice award. Superb GUI and CLI management tools and excellent reporting and debugging tools pushed the MAX to the top. Close behind came the Ericsson Tigris, 3Com Total Control and Cisco AS5300. While all three had good management and debugging tools, none had the reporting found in Ascend's solution. Lucent's PortMaster 4, a new entry in this market, is full-featured but lacks some of the key components the winners have, such as thorough debugging tools and strong management, while maintaining a relatively high price per port. Finally, Multi-Tech's CommPlete and Shiva's LRAS DPS provide inade-

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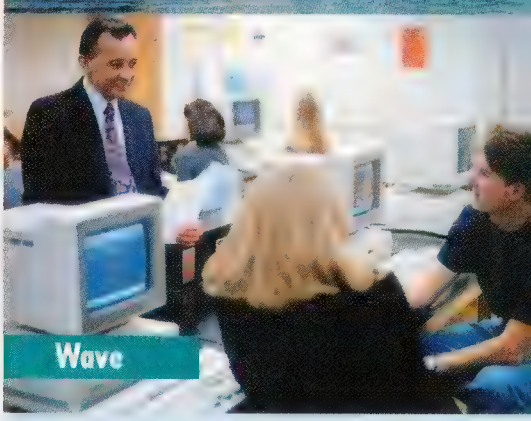


quate uptime and are comparatively difficult to manage.

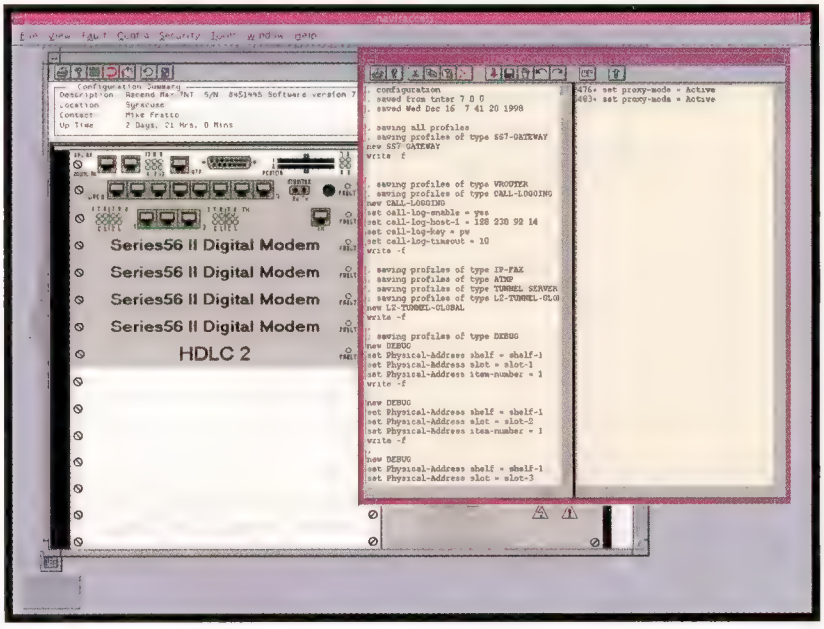
Ascend Communications MAX TNT

Ascend's MAX TNT is expensive but worth it. Outstanding management consoles, including the command line, NavisAccess and NavisConnect, provide unique features for every level of the organization. The TNT, which supports 720 modems, performed flawlessly along with the Cisco, Ericsson, Lucent and 3Com units during throughput and dial tests.

NETWORK COMPUTING EDITOR'S CHOICE

The TNT also supports a variety of authentication, VPN protocols and WAN technologies, all of which are hot-swappable—unlike those found on the Cisco AS5300, Multi-Tech CommPlete and Shiva LRAS servers. But there is a price to pay: $685 per port for the system we tested ($778 if you include the price of NavisAccess)—the highest of these systems.

Customers have tight uptime requirements, so redundant services are a must. Like the other devices in this test, the MAX comes with redundant power supplies to maximize uptime, and critical services, such as RADIUS, SNMP and DNS, can be configured with backup servers. Modem and system software are upgraded via NavisConnect or a TFTP server, though you must reboot the system for the new software to take effect. But you cannot "busy out" the modems, so users are dropped when the reboot takes place. Ascend says it can't accurately determine the appropriate "service unavailable" signaling for telco switches.



Configuration auditing using Ascend MAX TNT's NavisAccess is a powerful tool.

Managing the TNT from the command line or GUI is a breeze. The TNT doesn't have the VT-100 terminal screen found in smaller MAX units. Like all CLI schemes, Ascend's takes some time to learn, but context-sensitive syntax helps. Ascend uses a profile scheme, in which configuration takes place in different sections of the TNT. Unique among the CLI-editing features, configuration sections are first read into an edit buffer, where changes are made, and then to memory. This enables you to view other configuration profiles while editing without having to drop out of edit mode,

Report Card

Enterprise Remote-Access Servers

Feature	Weight	Ascend MAX TNT	Ericsson Tigris 7-Slot	3Com Total Control Platform with HiPer Access System	Cisco AS5300	Shiva LanRover Access Switch DPS	Lucent PortMaster 4	Multi-Tech CommPlete
Management console	25%	5	4	4	4	4	4	4
Reporting	20%	5	4	4	4	4	3	3
Debugging	15%	4	4	4	5	3	2	2
Performance	15%	5	5	5	4	4	4	3
Availability	10%	4	4	4	3	2	4	2
Price per port	10%	1	5	4	4	2	2	3
Features	5%	5	4	5	5	2	4	3
Total score		**4.35**	**4.25**	**4.20**	**4.10**	**3.35**	**3.30**	**3.00**
A≥4.3, B≥3.5, C≥2.5, D≥1.5, F<1.5 A-C grades include + or – in their ranges.		**A–**	**B+**	**B+**	**B+**	**C+**	**C+**	**C+**

Total scores and weighted scores are based on a scale of 0-5.

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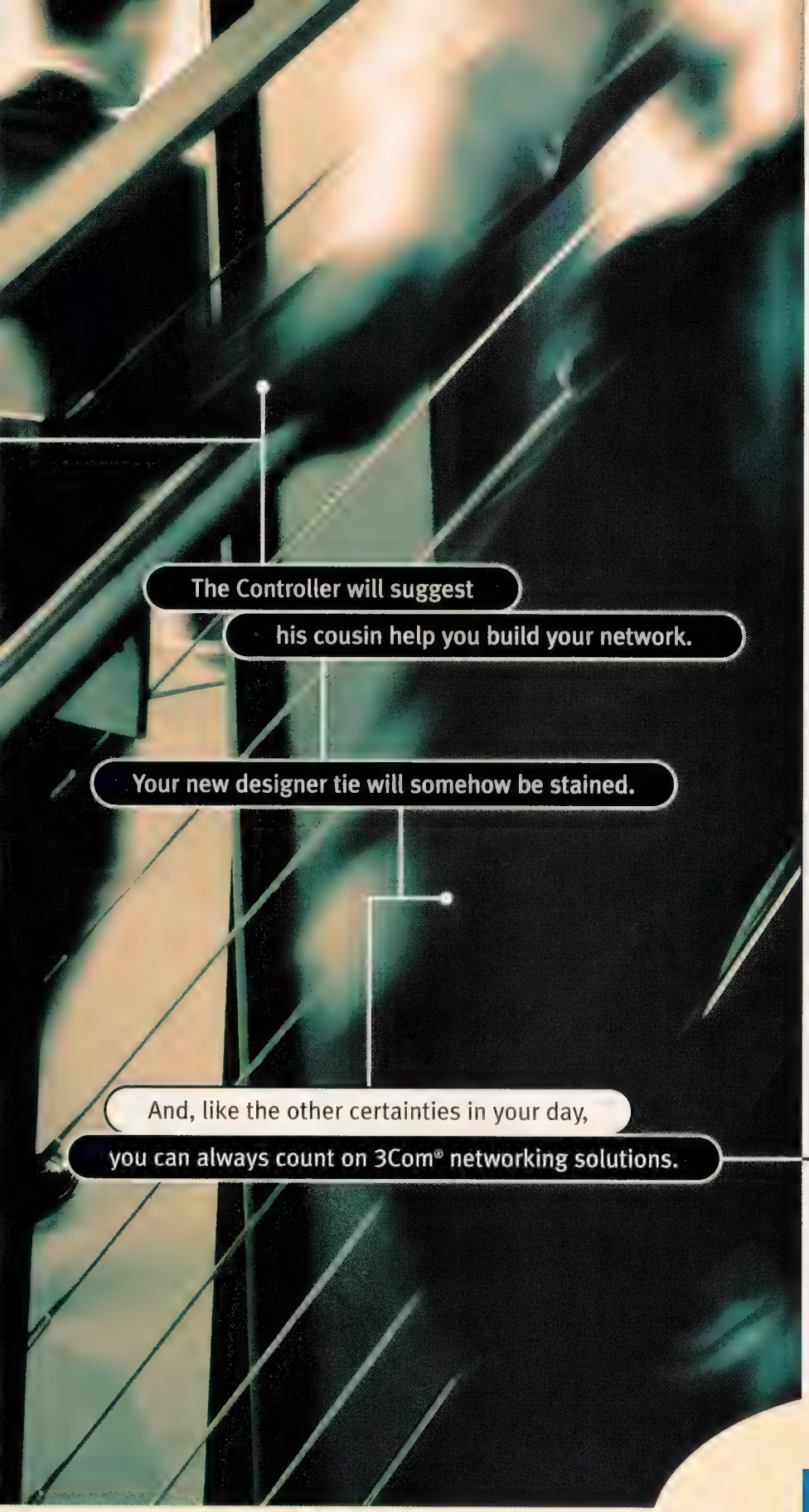
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read the configuration and resume edit mode—a distinct advantage over Cisco's IOS (Internetworking Operating System).

NavisConnect, the TNT's Java-based configuration utility, is much like Shiva's Java Configurator, though it lacks Shiva's monitoring capabilities. NavisConnect simplifies initial configuration by hiding the command-line details behind check boxes and default settings. Once we started NavisConnect, we gave it the TNT's IP address and it downloaded the configuration from the TNT. We made our changes and sent it back. We also saved the configuration locally for safety reasons. The Explorer-like interface is intuitive and useful.

With NavisAccess, Ascend's enterprise management GUI, the administrative power comes in. This tool can run as a standalone or within Hewlett-Packard Co.'s HP OpenView on Windows NT or Unix; we used a Sun Microsystems SPARC10 with Solaris 2.6. Available for nearly all Ascend Pipeline and MAX devices, it has extensive reporting and scheduling mechanisms that surpass almost all other management stations; CiscoWorks 2000 is a possible exception. For example, we were able to archive and compare configurations during testing within NavisAccess. If we made a configuration that caused a failure, we could see what changes had been made and revert to a working configuration.

We found the NavisAccess scheduler exceptionally useful, too. We could automate management tasks, such as retrieving and archiving configuration changes and publishing reports. Even firmware updates can be scheduled with a few short keystrokes.

Although all the RASes we tested provide accounting via RADIUS, NavisAccess goes further by accepting RADIUS accounting and compiling canned reports for billing and monitoring. The reports can be output to a variety of formats, such as CSV (comma-separated values) or HTML. System messages also can be archived to provide a historical view of the TNT. We liked the canned reports; they provided pertinent accounting information, such as start and stop times, data transferred and other connection information. The error history and trending reports were compelling. Port unavailability, modem retrains, WAN errors and other low-level information can be tracked for historical analysis and capacity planning.

Installation and Maintenance

Although remote-access server vendors have vastly improved manuals, quick starts and GUI installation routines over the years, the real power still lies at the command line. In our tests, getting a basic configuration on the servers—enough to use a GUI—meant applying IP addressing and rebooting the box. From there we could set up configurations and point the remote-access server to network services such as RADIUS (Remote Authentication Dial-In User Service), SNMP and syslog. These were simple tasks.

And yet, every technical-support person we consulted made a beeline directly to the command line to perform functions or make changes. Often, features such as low-level debugging and numerous non-mainstream configuration options are found at the command line rather than in the GUI. In many cases, we could configure the servers more quickly through the CLI than the GUI. Not knowing how to use the CLI is like using Windows98 without understanding DOS: You can get things done, but advanced procedures may be out of reach.

Many installation options have been refined, and in most cases defaults are acceptable. As vendors install more devices, their customers tell them what they need. In previous tests, we had to step through nearly every option, from configuring the WAN to setting PPP options and authentication methods. With the proliferation of RADIUS for remote-access authentication, access control and configuration, WAN options such as addressing, protocol support and authentication methods are set per user instead of on the remote access server itself.

Ericsson Tigris 7-Slot

Ericsson has greatly improved the Tigris 7-Slot since we last tested it. If you're looking for a less-expensive alternative to Ascend's MAX TNT, this server's fine performance and robust management application, RiverView, make it a worthy contender.

The Tigris 7-Slot handles up to 240 modems per chassis. Our configuration had four 48-port modem cards; a controller card with four PRI (Primary Rate Interface) ports, remote-access server and chassis management; and an additional PRI card, all at $323 per port. By default, incoming calls are routed to the next-available modem. Channels can be mapped to specific modems.

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same type because the controller sets the card type at bootup. For example, a Quad PRI card can't be swapped with a 48-port modem card without a reset.

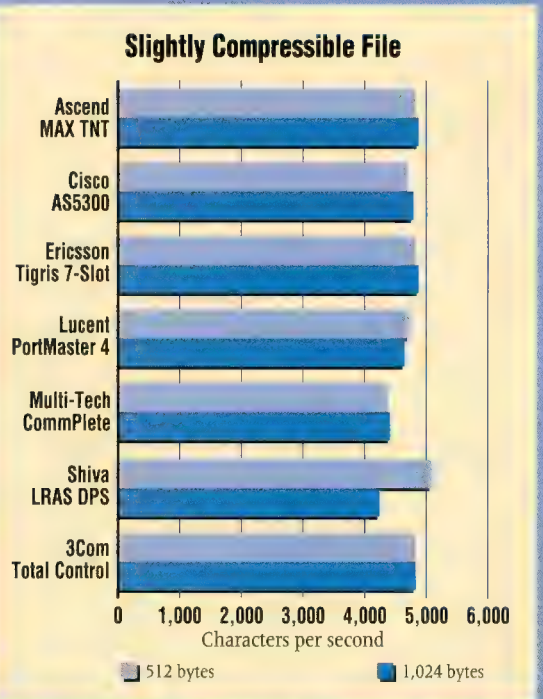
Ericsson also has beefed up RiverView, an SNMPc-based management application that provides a wealth of information. Although RiverView doesn't have nearly the same canned scheduling and reporting functionality as NavisAccess and suffers under load, the application is full of views and data items. From the main view of the Tigris, cards are brought to the foreground. During testing, we monitored the modems' status to ensure the calls were coming up. We also looked at details such as line lev-

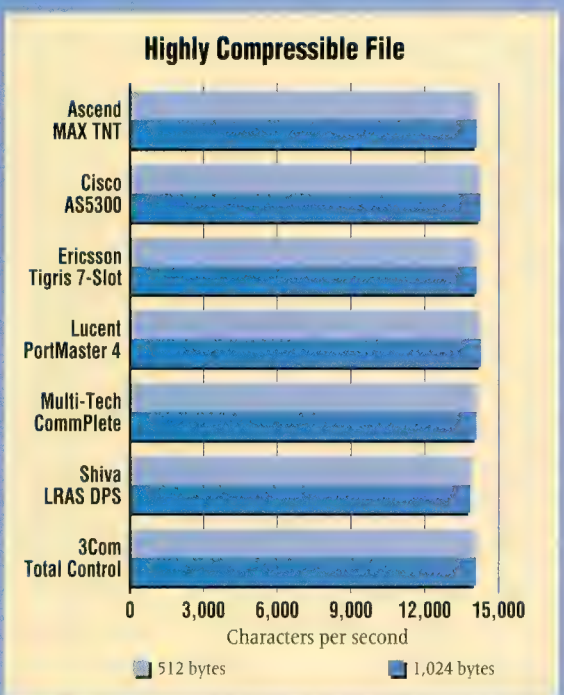
How We Tested Remote-Access Servers

The key to testing remote-access servers is making all ports transfer data at once. While this is an unusual circumstance, it indicates how well the server can handle extreme loads and how well it can be managed.

To accomplish our goal, we used Midnight Networks' Avalanche 2.0X5 RA and simulated 384 PPP clients. We ran two of Avalanche's scripts: throughput.avl, which determines the fastest data transfer rate at a specified packet loss, and connect speeds.avl, which tests call handling. For the transfer-rate test, we allowed a 10 percent data loss and a 10 percent port loss, and used two packet sizes (512 bytes and 1,024 bytes) and two data types (low and high compressibility).

In general, the results for the 1,024-byte and 512-byte tests were about the same using the highly compressible file. We used all the available bandwidth regardless of modem connect speed with throughput exceeding 95 percent of





115,200 bps, the maximum DTE rate. Even if we could test 56 Kbps, the test would have been limited by the DTE rate. The 1,024-byte packet using the slightly compressible file fared slightly better than the 512-byte packet, probably because of compression of the PPP header with V.42bis.

For the call-handling test, we used connect speeds.avl to simulate eight calls per second. We ran the test 100 times, for a total of 10,800 attempts—a task that took slightly less than 24 hours to complete. All seven remote-access servers completed 99 percent or more of the calls.

We removed the possibility of data loss from collisions on the test network by using a Cisco Systems Catalyst 5000 with all ports locked at 100 Mbps, full-duplex. We used Funk Software's Steel-Belted Radius for user authentication and accounting, and Castle Rock Computing's SNMPc for generic SNMP management. A Linux server

(Continued on page 60)

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els and negotiated protocols.

Troubleshooting user connections is somewhat weak when using RADIUS authentication; unlike the Cisco and 3Com solutions, there is no way to trigger PPP decodes based on incoming user names. The only way to do so is to debug all users, or have them dial specific numbers tied to individual ports and debug on each port. Neither solution is very useful. Fortunately, PPP decode information can be directed to SNMP trap hosts from the CLI for remote debugging—though the decodes are interleaved with other SNMP messages.

Ericsson's Web-based management interface, unlike MultiTech's excellent example, is useful for only two reasons: its Pscope and Tscope debugging tools, which provide unique views into the Tigris. The rest is a rehash of the command line. Tscope is in controlled release and provides

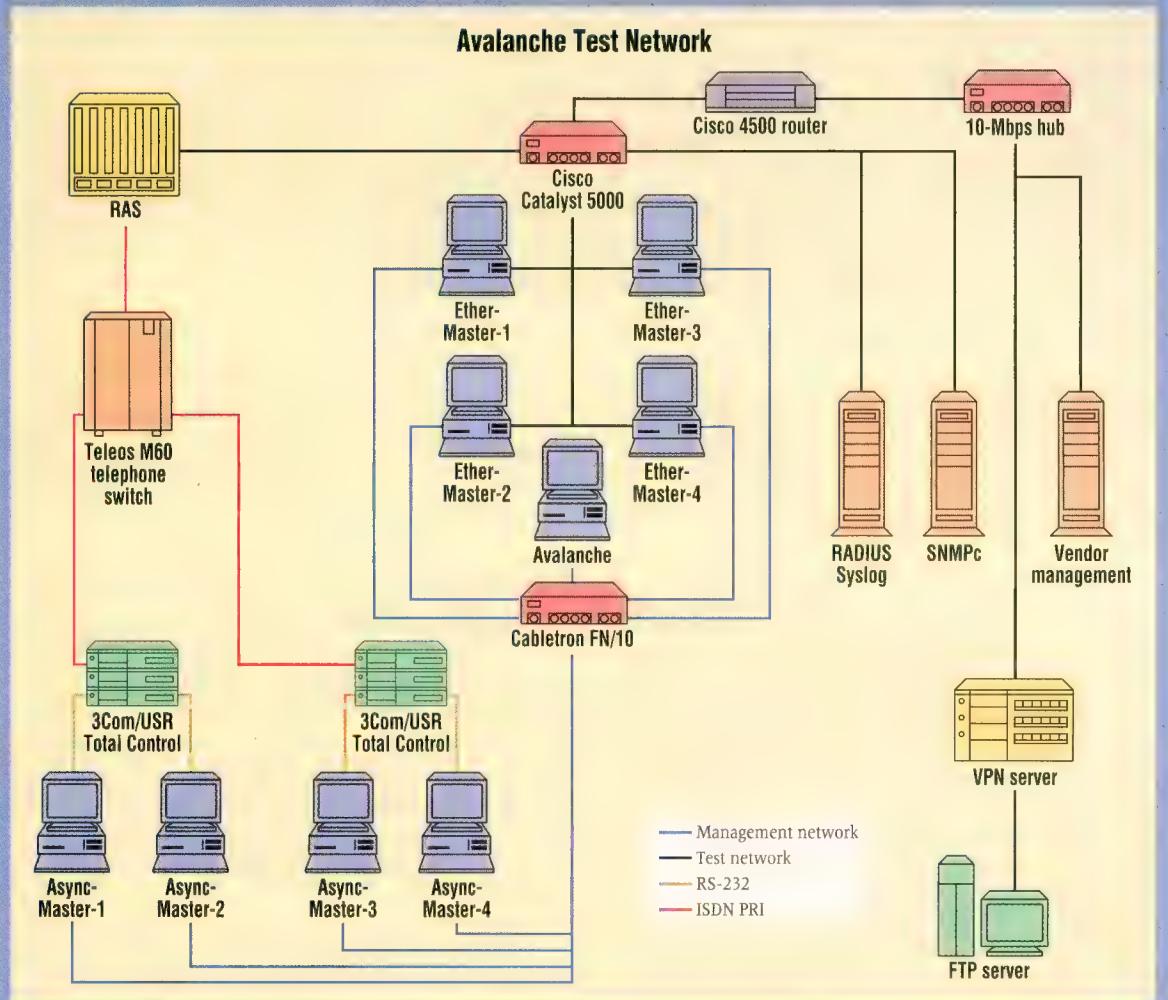
How We Tested Remote-Access Servers

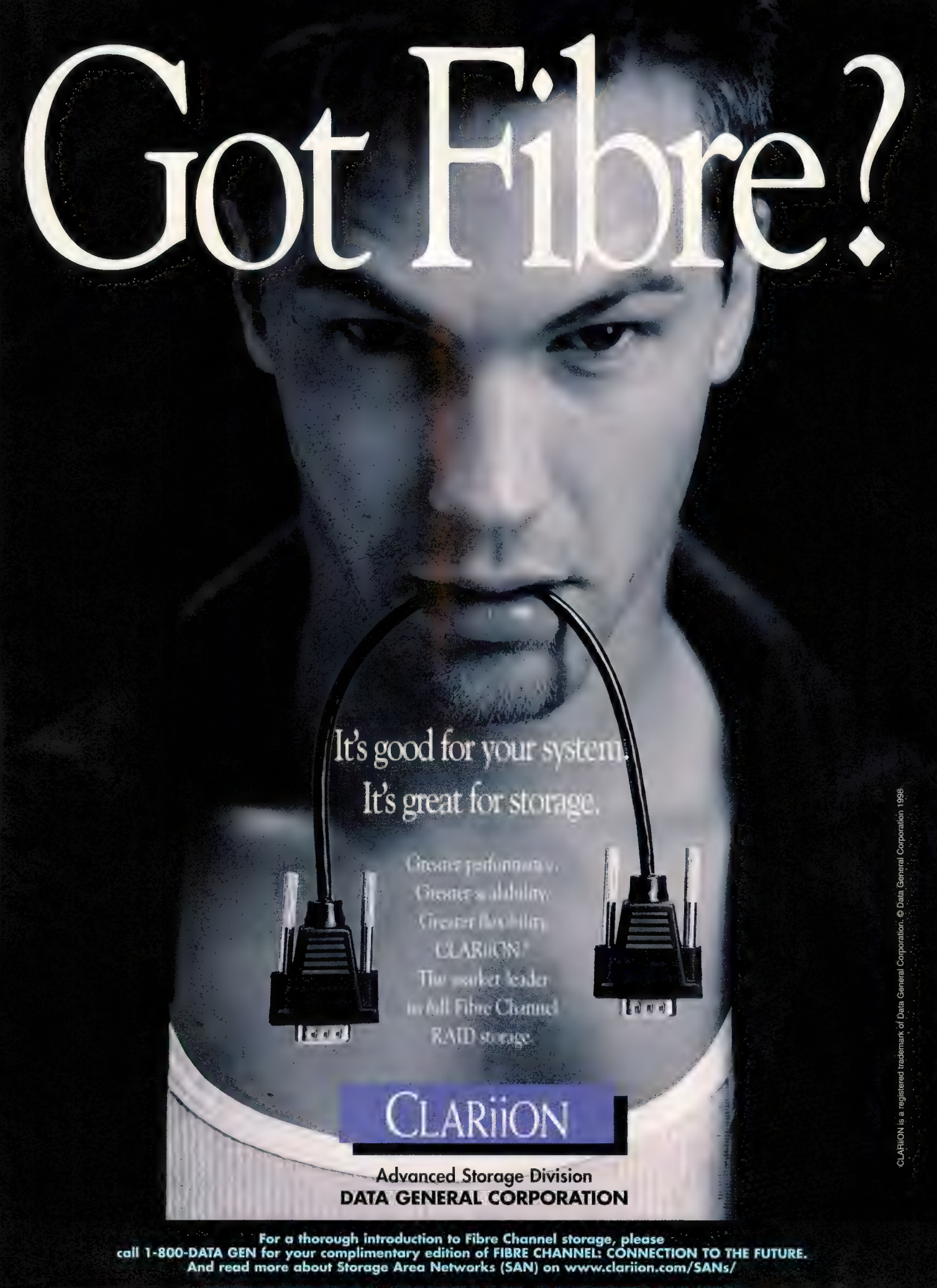
(Continued from page 58)

provided syslog services, and Xlan Technologies' SonicView provided PPP tracing and debugging.

We encountered few variations in performance. Similarly, when we tested how well the servers handled simultaneous calls, there were no surprises; during the past three years, performance has improved across the board and variations among vendors have virtually disappeared.

We did see severe impairment of management during the throughput testing; however, manifested by slow response times or communications failures. This indicates that the remote-access-server vendors focus on data throughput over management. Although that may be a good idea in general, the MultiTech, Shiva and 3Com units' management software occasionally failed under high load. However, we saw no management problems when using the command line.

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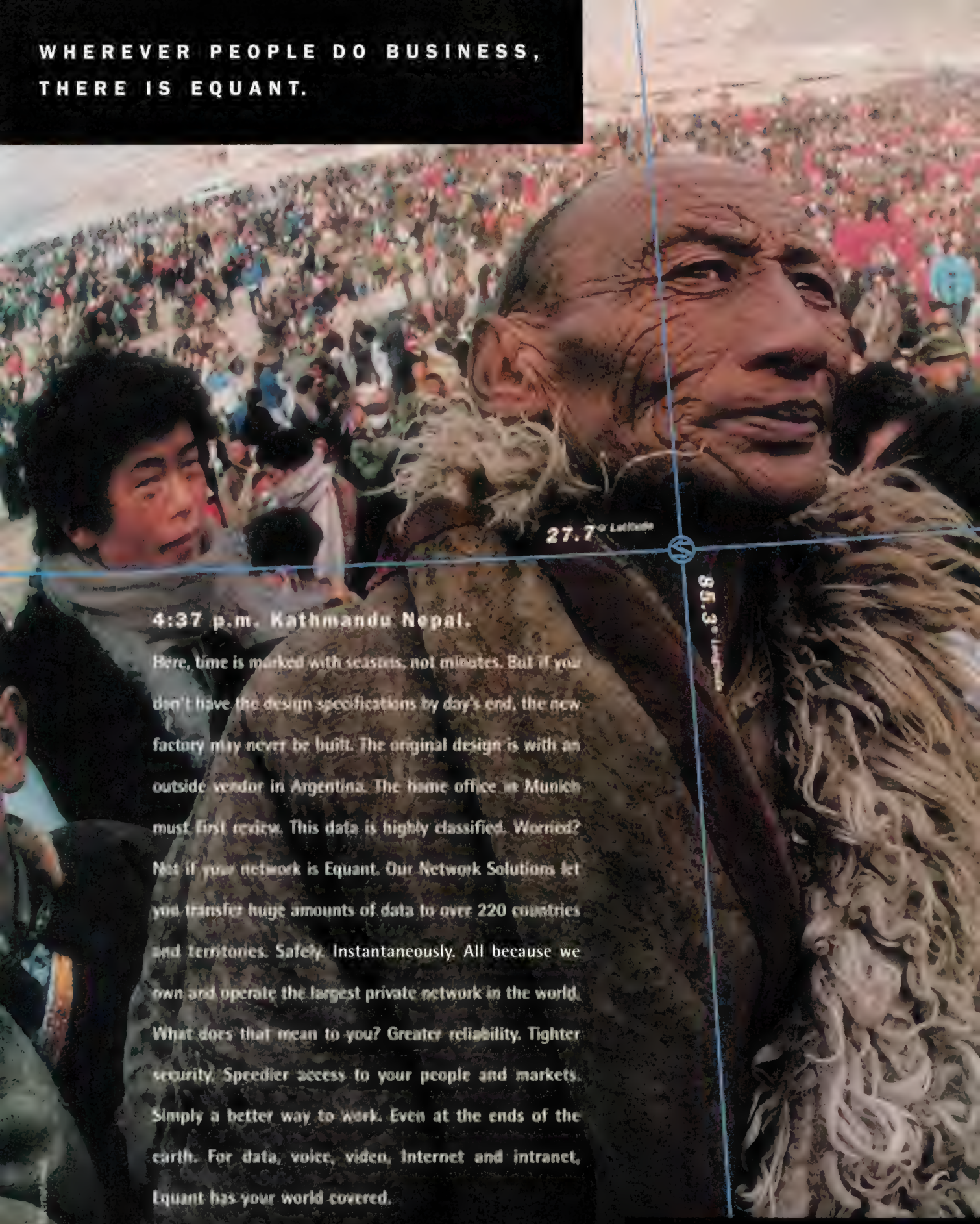
Enterprise Remote-Access Server Features

	Ascend MAX TNT	Cisco AS5300	Ericsson Tigris 7-Slot	Lucent PortMaster 4	Multi-Tech CommPlete	Shiva LanRover Access Switch DPS	3Com Total Control Platform with HiPer Access System
Hardware:							
Max. T1/PRI spans supported	30+	8	28	30+	8 T1, 4 PRI	8	15
T1/PRI channels shared across all modems	●	●	●	○	●	●	○
ISDN NFAS support	●	●	●	●	○	○	●
Max. modems supported	720	240	240	864	96 w/PRI, 192 w/T1	72	360
Modem protocols supported	V.34, K56flex, V.90, V.34bis, V.FC, V.32bis, V.32, V.22bis, V.22A/B, V.23, V.21, MNP10EC, V.42 LAPM, V.42bis	V.34, K56flex, V.90	V.34, K56flex, V.90, V.110 (GSM mobile), V.32bis, V.22bis, V.34+, V.42 and MNP2-4, V.42bis and MNP5, MNP10	V.34, K56flex, V.90, V.34bis and below	V.34, K56flex, V.90, all V. standards	V.34, K56flex, V.90	V.34, X2, V.90, V.32bis, V.22, V.22 bis, V.42, V.42bis, MNP2-4, MNP5
Max. power supplies supported	2	2	2	3	2	2	2
Hot-swappable components	Modems, T1/PRI, RAS, power supply, E1/PRI, VoIP, RDSL, ADSL, IDSL, ATM/DS3, V.35, HDLC2, all-slot card	RAS	Modems, T1/PRI, RAS, power supply	Modems, T1/PRI, RAS, power supply, fans, System Manager module	RAS	None	Modems, T1/PRI, RAS, power supply, network management card, all cards
Management:							
Software management station	NavisAccess	CiscoWorks 2000, Cisco Access-Manager 3.0	RiverView for Windows	PMVision	MultiCom Manager	Shiva Configurator 1.5	Total Control Manager, Distributed Total Control Manager
Management methods supported in addition to CLI, GUI, telnet, SNMP and file	None	None	Web-browser interface	None	HTTP	None	None
Operating system support	Windows NT, Unix, Java	Windows95, 98, NT, Unix, OS/2, Java	Windows95, 98, NT	Windows95, 98, NT, Unix, OS/2, Java	Windows95, 98, NT	Windows95, 98, NT, Unix, Java	Windows95, 98, NT, Unix
Compatible network management systems	HP OpenView	HP OpenView, HP Network Node Manager, Castle Rock SNMPc	Castle Rock SNMPc, HP OpenView for Windows	Lucent OneVision, HP OpenView	MIB2-compliant SNMP manager	None	3Com Transcend Network Manager, HP OpenView, Sun NetManager
Manages multiple RASes simultaneously	●	●	●	●	●	○	●
Configures multiple RASes simultaneously	●	●	●	●	●	●	●
Network services supported	RADIUS, TACACS, TACACS+, DHCP, BOOTP	RADIUS, TACACS, TACACS+, DHCP, BOOTP	RADIUS, DHCP, BOOTP	RADIUS, BOOTP	RADIUS, TACACS, TACACS+, DHCP	RADIUS, TACACS, TACACS+, DHCP, BOOTP	RADIUS, TACACS+, DHCP, BOOTP
Tiered management	●	○	●	○	●	○	●
Software and firmware upgradable from management station	●	●	●	●	●	●	●
Software and firmware upgradable via network/serial cable/hard media	●/●/○	●/●/○	●/●/○	●/●/○	●/●/●	●/●/○	●/●/○
Name of vendor's AAA server	Ascend Navis Radius	CiscoSecure	Funk Software's Steel-Belted Radius	Lucent RADIUS, Lucent RADIUS ABM optional	None	Secure Access Manager	3Com Security and Accounting Server
Logging methods employed: traps/syslog/text file/proprietary/console/RADIUS	●/●/○/●/●/●	●/●/●/●/●/●	●/●/●/●/●/●	●/●/●/●/●/●	●/●/●/●/●/●	●/●/●/●/●/●	●/●/○/○/●/●

● Yes ○ No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Enterprise Remote-Access Server Features (continued)

	Ascend MAX TNT	Cisco AS5300	Ericsson Tigris 7-Slot	Lucent PortMaster 4	Multi-Tech CommPlete	Shiva LanRover Access Switch DPS	3Com Total Control Platform with HiPer Access System
Management (continued):							
Other logging methods employed	CDR (Call Detail Reporting)	None	None	None	None	None	None
Management supports automated events on traps	●	●	●	●	●	●	●
Custom events available	●	●	●	●	●	●	○
Debugging tools available	CLI command line and various applets under NavisAccess	Command line, HTTP, health-mon.MIB	PSCOPE, TSCOPE, SNMP traps (seven message levels), console traps	Modem, ISDN, PPP, routing, filtering	Stat.-analysis event data program	CLI, syslog, PPPTRACE	Command line
Features:							
Dial-up protocols supported: terminal, PPP, SLIP, CSLIP, ARA, MLPP, multichassis MLPP, BACP	●/●/●/●/ ●/●/●/●	●/●/●/●/ ●/●/●/●/	●/●/●/●/ ○/●/●/●/	●/●/●/●/ ○/●/●/●	●/●/●/○/ ○/●/●/○	●/●/●/○/ ●/●/○/●	●/●/●/●/ ○/●/●/●
LAN protocols supported over dialup: IP, IPX, AppleTalk	●/●/●	●/●/●	●/●/○	●/●/○	●/●/○	●/●/●	●/●/○
LAN-to-LAN routing supported	●	●	●	●	●	●	●
Compression types supported: VJ compression, stack	●/●	○/●	●/●	●/●	○/○	●/●	●/●
Other compression types supported	Stac, Ascend Stac, MS-Stac	MPPC	MPPC, CCCP	None	None	None	Microsoft Stac
Authentication schemes supported: PAP, SPAP, CHAP, MS-CHAP	●/○/●/●	●/○/●/●	●/○/●/○	●/○/●/●	●/○/●/○	●/●/●/○	●/○/●/●
Other authentication schemes supported	Token cards, call back, CLID, DNIS, IP address, MAC address	None	None	None	None	None	None
VPN protocols supported: PPTP, L2TP, L2F, IPSec	●/●/●/●	●/●/●/●	○/●/○/●	○/●/○/●	●/○/○/○	○/○/●/○	●/●/○/○
Other VPN protocols supported	ATMP (HA, FA), Virtual IP Routing, IP in IP, IPSec, Mobile IP, GRE	None	None	None	None	None	IPsec available in a future software release
RMON groups supported	None	Events and alarms	None	None	None	None	None
VPN tunnel configuration: static, domain name, user name, RADIUS, called number, calling number	●/●/●/●/●/●	●/●/●/●/●/●	●/●/●/●/●/●	●/●/●/●/●/●	●/○/●/○/ ○/○	○/○/●/●/○/○	●/●/●/●/●/●
Other methods of VPN tunnel configuration	Per DS1 trunk, Secure Connect Manager	None	None	None	None	None	None
Y2K-compliant	●	●	●	●	●	●	●
Warranty	Media, 30 days; software, 90 days; hardware, one year, *www.ascend.com/856.html*	One year	12-month standard, 18-month extended warranty available	Standard one-year hardware and software; extended warranty available	Two years	One-year hardware, three years software	Software support, 90 days; hardware, two years; extended plans available
Price	$131,450	$68,620	$61,995	$112,080	$85,490	$124,000	$72,215
Management-station price	$13,995 for application suite, $3,995 for device-license	$9,995 (CiscoWorks-2000)	$1,895	Free	Free	Free	$2,059

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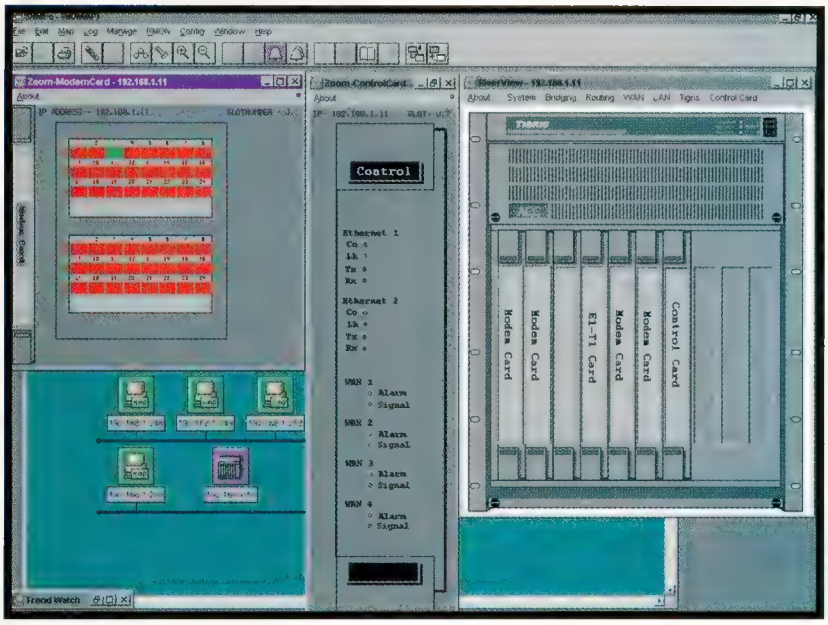


Ericsson's RiverView management platform offers easy navigation through Tigris devices.

real-time monitoring of the traffic of nearly every aspect of the Tigris. Tscope is highly configurable, monitoring up to five items simultaneously. We tracked Ethernet packet counts, modem connect speeds and retrains, and other performance metrics.

The Java Configurator was easy to use and let us configure the device once we established the initial IP address settings. Ericsson's Configurator builds a script and then sends it to the Tigris as a series of commands. This eases much of the burden on the CLI, but unlike Shiva's Configurator, it doesn't read configurations from locally saved files or from the running Tigris. Any changes that the Configurator doesn't specifically support need to be made each time the utility is run. We would like to see the Configurator read, archive and compare configuration files.

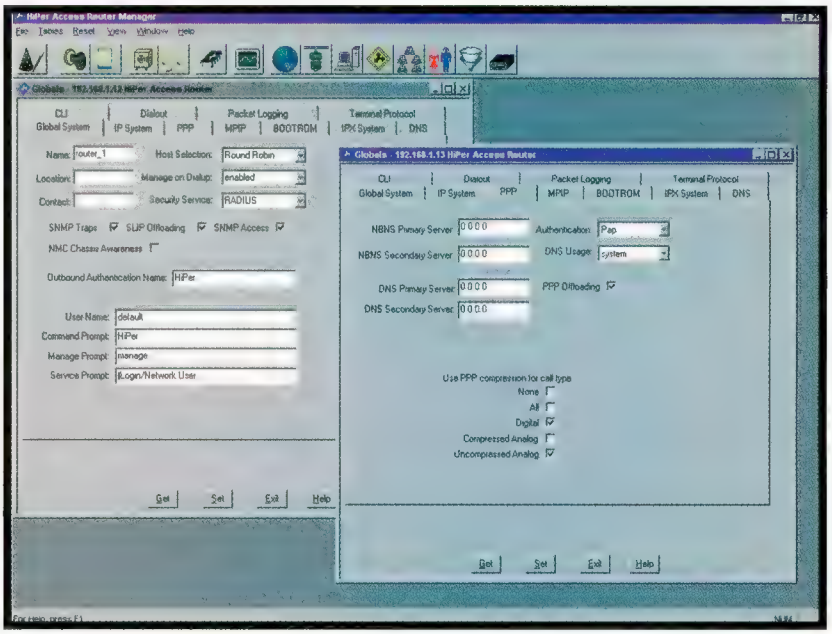
3Com Corp. Total Control Multiservice Access Platform With HiPer Access System

3Com has made some significant strides with the HiPer access router card (ARC) system for its Total Control Network Hub chassis. Not only was Total Control the simplest RAS to install, but its new GUI and CLI management tools are more robust and easier to use than before. The $376 price per port is relatively low considering the Total Control system's flexibility and functionality.

While the chassis can support 14 HiPer DSP (digital signal processor) cards—enough for 360 modems—we had only eight cards. We also had two HiPer cards that provided remote-access services, and one network management card (NMC) for the chassis. The HiPer DSP cards contain 24 modems and, paired with a PRI NIC, provide a digital head end. Each HiPer DSP card relies on the associated PRI for network connectivity—there is no modem sharing among HiPer DSPs. Each HiPer ARC manages up to seven HiPer DSP cards, but we assigned four HiPer DSP cards to each of our two HiPer ARC cards. Only the traffic in and out of the router is sent over the backplane along with management traffic.

3Com is no longer reselling ComOS from Livingston, recently purchased by Lucent. Instead, the company has developed a very robust yet easy-to-use CLI that rivals Cisco's IOS in many respects.

Total Control Manager (TCM), 3Com's modem management software, will be familiar to anyone who knows the company's Total Control hubs. Using SNMP, TCM presents clickable images for the Total Control hub's inserted cards. Configuring the modems



Each of 3Com's Total Control HiPer ARCs is managed individually.

involves navigating through a series of drop-down menus in the card view and selecting the options. Once one modem's configuration is set, it can be copied to the rest. All that remains is saving the configuration to the modem's NVRAM on the modem, and saving it to the chassis' NVRAM. In the past, we had management problems with the modems, and TCM sometimes even forgot configurations. We didn't experience any of that this time, but we saw degradation in management when the Total Control was under load—common among SNMP-based management systems.

3COM's Total Control was the simplest RAS to install, and its new GUI and CLI management tools are more robust and easy to use than before.

A separate application, HiPer Access Router Manager, handles the HiPer ARC cards. Though the HiPer ARC required only a few changes, such as pointing it to RADIUS, SNMP trap hosts and syslog, we couldn't copy the configuration from one card to the other. We preferred the command line for configuration tasks; it has more commands, and the debugging and monitoring features.

As with the Cisco AS5300, we could debug individual users once they began PPP authentication via the command line, though the individual options were expressed in hex, which requires considerable work for managers.

Cisco Systems AS5300

At about three inches tall and 19 inches wide, Cisco's AS5300 is by far the most compact RAS we've seen at this density—eight PRIs and 240 modems. That works out to a very reasonable $357 per port. Paired with CiscoWorks 2000 and CiscoView management platforms, the AS5300 will easily drop into any network environment. However, this RAS lacks some of the advanced management features found in NavisAccess, and the lack of hot-swappability is disappointing.

The AS5300 we tested featured two 96-port modem cards and an eight-port T1 card, as well as Cisco's IOS 12.0. CiscoWorks 2000, Cisco's cross-platform management software, is aimed at environments rather than a single Cisco device, and provides a number of generic functions for Cisco's equipment line. SNMP trap and syslog parsing, event reporting, software version, and configuration auditing and control are some of the advanced features available.

Although many of the features don't apply specifically to remote access, we were impressed with the configuration auditing system. Much like NavisAccess, configurations can be archived and used for future comparisons. Any activity is also logged with CiscoWorks for tracking changes. We would have liked more canned reports tailored to the remote-access environment; noticeably absent were reports for user accounting and historical accounting analysis.

We found many enhancements to Cisco's IOS that made it a snap to manage 240 modems via the command line, and learning IOS isn't difficult. We set basic configuration options for the PRI lines, placed all of the modems into one group for configuration and management, and pointed the AS5300 to our RADIUS server, all from the CLI. Context-sensitive syntax help and command completion were useful.

CiscoView is Cisco's SNMP management GUI, designed specifically for the AS5300. Within CiscoView, we could monitor the status of the AS5300 at many levels, from global device configuration and status to individual modem performance and connection parameters, much like Ericsson's RiverView.

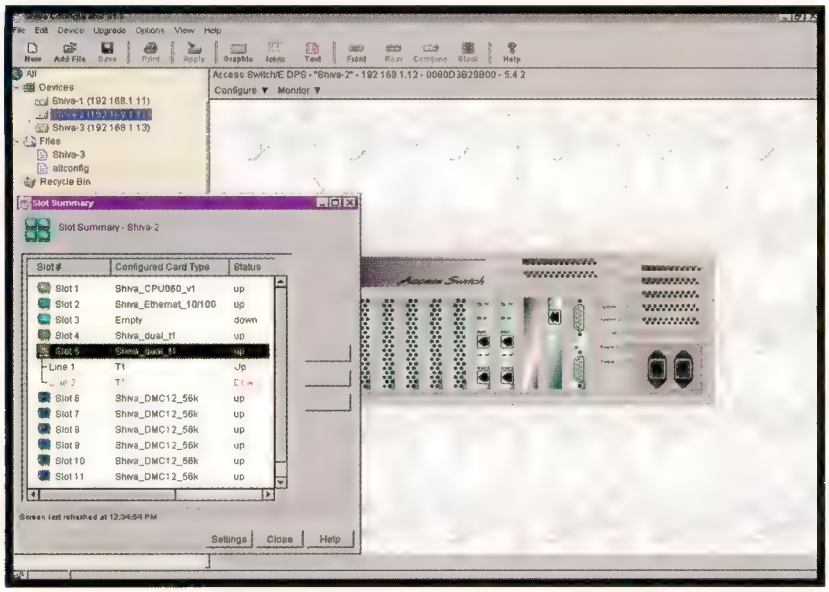
Cisco IOS's debugging features outstrip any others we've seen. Not only can users be debugged from authentication, but debugging triggers can be created for nearly any event, so you can tightly control debug output based on specific parameters.

In the final analysis, the AS5300 is a strong RAS box and a natural fit for a Cisco shop.

Shiva Corp. LanRover Access Switch Dual Power Supply

Much of the Shiva LRAS DPS hasn't changed since the last time we looked at it, and that's a plus for environments with Shiva experience. We were surprised, however, to find that we needed three—not two—LRASes to create our 184-modem test bed. With its $585 price per port—matching Lucent but well below Ascend—the LRAS DPS is more well-suited to environments that need fewer port densities.

We had three LRAS DPS units loaded with six digital modem cards (72 modems per box), two dual T1/E1/PRI interface cards, a 10/100 NIC and the management card running a Motorola 6806 CPU. The cards are connected to the CPU via a PCI bus. A ribbon



Shiva's Java Configurator provides detailed status information.

cable connects the PRI cards to the modem cards. Overall performance was comparable to that of the other units.

Shiva Net Manager is virtually unchanged from earlier versions, and is not on par with other management consoles. It's difficult to navigate, and offers limited configuration options. Many options are configured in sections, with a catch-all section for manual text entry. But we found that manually adding configuration parameters required to support Funk Software's Steel-Belted Radius caused apparent configuration conflicts that we had to fix from the command line.

Java Configurator (we used version 1.5) is much more usable than Shiva Net Manager, and offers some unique features for monitoring and management. For example, Net Manager lacks the ability to get real-time statistics, whereas Java Configurator gives you that information. You can monitor connected users, their connect times and throughput all in real time. We also looked at the activity log and slot summary information. Configurator lets you send configurations to multiple Access Switches by stripping out LRAS-specific configurations, such as IP addresses. We created a configuration file for a single device and when it was working properly distributed it to the other LRAS units. As with the CommPlete, each configuration change required a system reset.

But the Java Configurator is a double-edged sword. While some nice enhancements are built in, it is, like most Java applications, slow even on a 233-MHz Pentium II with 64 MB of RAM running Windows NT 4.0. Trying to compare two configurations meant having to wait for Java Configurator to refresh itself and then rewrite the screen at every turn. This is fine if you don't need to make major changes to the LRAS DPS, but initial configuration or reconfiguration can be trying. It's easier to edit in the text window.

The upgrade process completely disrupts the server. Unlike units that let you send upgrades to the box without disrupting current connections, the LRAS DPS goes into downloader mode, which allows it to accept new images. This mode drops all calls; there's no option to send the code and complete the upgrade later. Modems can be busied out so that user connections are not dropped, but without a scheduler you have to ensure that personnel will be on hand to perform the upgrade during slow periods—often after working hours.

Historically a strong enterprise remote-access device, the Shiva LRAS DPS has not kept pace with improvements in uptime and management. While it has a place in an office that services a few hundred users, other

Links for Additional Information

"Sizing Remote Access: A Straight Shot in the Dark," (NETWORK COMPUTING, Feb. 15, 1998) *www.networkcomputing.com/903/903ws3.html*

"Getting the Best Enterprise Remote Access" (NETWORK COMPUTING, May 1, 1998) *www.networkcomputing.com/908/908buyers.html*

"The Right Tool for the Job: PPP Analyzers Help Debug Remote Access" (NETWORK COMPUTING, August 15, 1998) *www.networkcomputing.com/915/915r2.html*

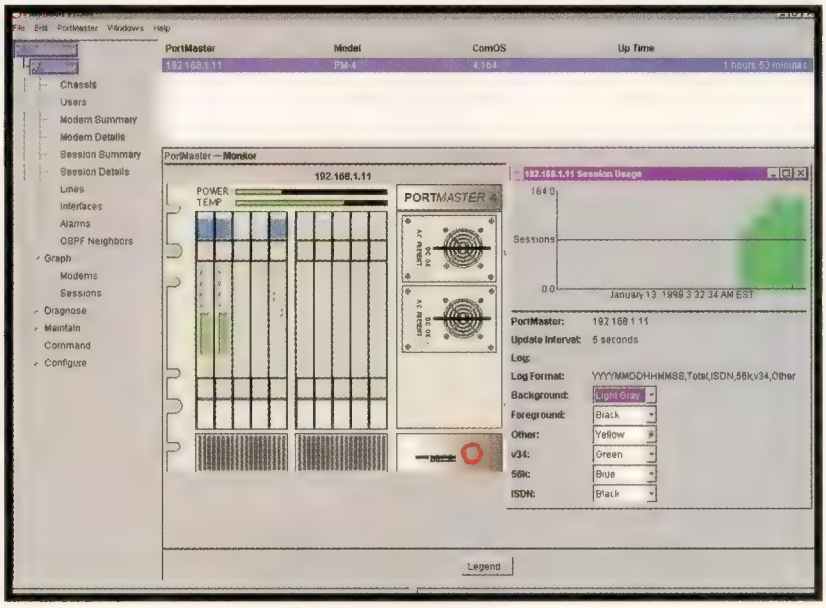
"Remote Access: Goodbye Modem Pools, Hello Service Providers" (*InternetWeek*, Nov. 30, 1998) *www.internetwk.com/trends/trends113098.htm*

"Cisco Resource Manager Essentials: A Must for Network Management" (NETWORK COMPUTING, Dec. 1, 1998) *www.networkcomputing.com/922/922sp1.html*

products are more well-suited to serving enterprise needs.

Lucent Technologies PortMaster 4

Lucent's PortMaster 4 has some impressive features, along with some rough edges. Although its management application, PMVision, is useful and the device performs well, we found the debugging features lacking and its $584 price per port rather high. We also wished we had some control over the modem configuration, such as AT command settings.



Lucent's Java-based PMVision provides real-time status monitoring.

With three load-sharing power supplies, an ATM backplane, and support for up to 864 modems, the PortMaster is geared for serious remote access. We tested it with four 48-port modem cards and a management card. There's room for two management cards for redundancy, but that feature wasn't functioning at test time. The cards are hot-swappable, though only like cards can be swapped without rebooting.

Through PMVision, the PortMaster 4's management software, nearly any changes to the device configuration occur dynamically, without rebooting. The exception is when management modules, such as an SNMP module, are added. Because these features are most often activated during initial installation, this shouldn't be an issue. A host of monitoring windows provides different views into the PortMaster, such as connected users, session summaries and details; there are also status indicators for both power and temperature. ComOS, the PortMaster firmware, has a rudimentary CLI that is not as robust as Ascend's or Cisco's.

User debugging was disappointing. While we could start PPP debugging on individual users, the output was in hex and required an interpreter. Lucent has one on its Web site, but it's neither efficient nor simple to use, and requires connectivity to the Internet. We'd like to see the PPP decoding more well-integrated into the GUI, along with automatic data decodes. The PortMaster also lacked the range of debugging facilities available for features, such as RADIUS authorization and accounting.

The PortMaster 4 is a good first product but it lacks some important options, such as modem configuration, PPP decoding and true hot-swappability. Still, it's built on a solid platform and shows promise for the future.

Multi-Tech Systems CommPlete

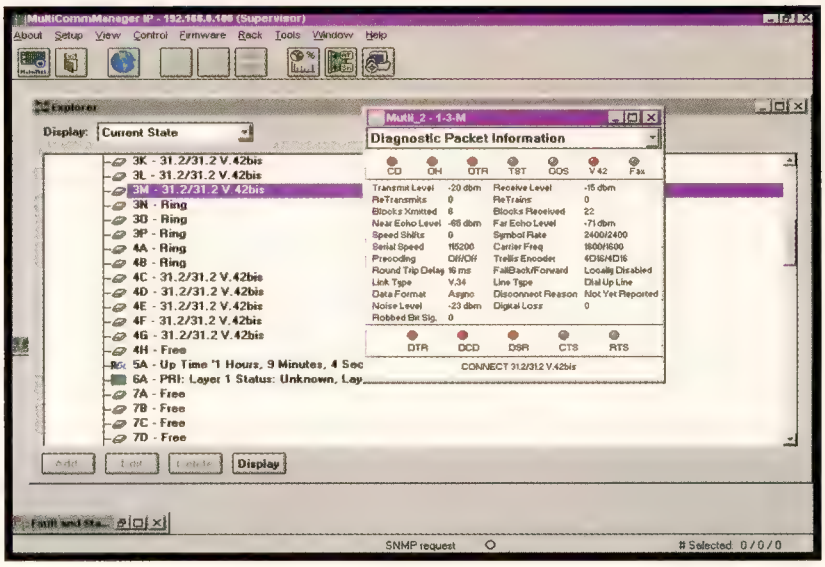
Only Multi-Tech's CommPlete runs on a 200-MHz Pentium PC running Multi-Tech's RasExpress software, which supports many x86 OSes, including Windows NT RAS, Unix and NetWare. The server's management tools—especially its excellent HTTP-based management—are much improved. But it's still missing a number of debugging features, and nearly all configuration changes require system resets.

Each CommPlete server supports only 96 modems with a PRI, so we required two systems to fill our 184-modem test bed. Each CommPlete contains four segments that house a remote-access server card, a PRI line card, a 16-port modem card and an eight-port modem card. Each segment is an individual RAS that requires its own IP address and configuration. Like the 3Com Total Control, the PRIs can't share modems. The segments are interconnected over a backplane to the controller card, which contains a fast Ethernet switch and provides chassis management. Only the power supplies are hot-swappable, but each segment can be powered down without affecting the others.

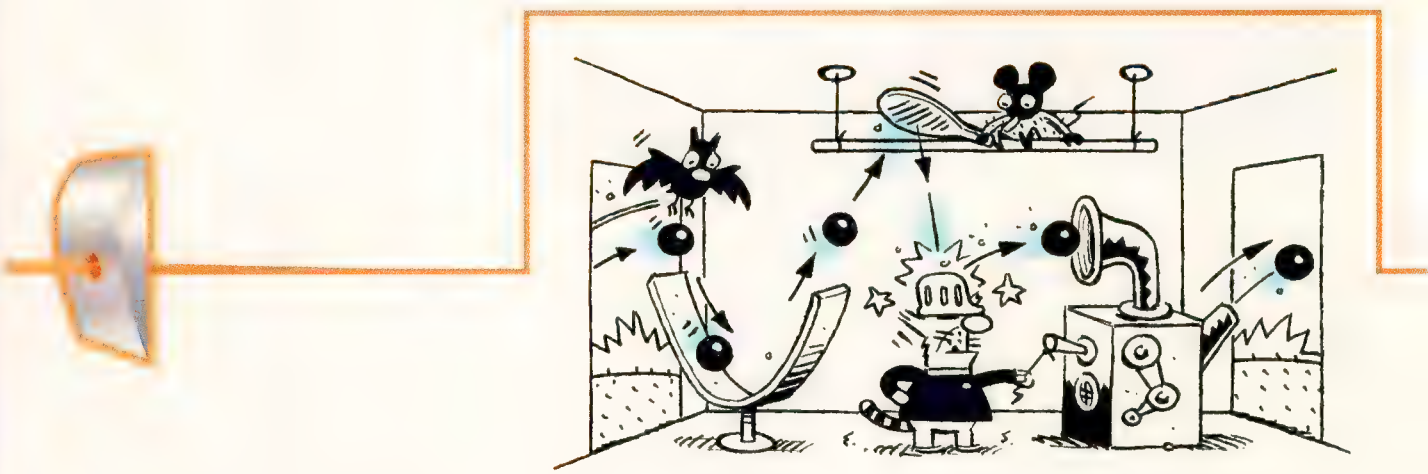
MultiCommManager, Multi-Tech's GUI, communicates via SNMP with the CommPlete units. Each CommPlete is treated as a discrete site, so it's impossible to manage all the servers simultaneously. Modems can be grouped, though only within a single CommPlete. Two views are available: Physical View displays information according to physical configuration; Logical View shows the same information by groups.

In either, we could drill down and see the status of the PRIs or the modems; we could even get esoteric connection information, such as transmit and receive decibel levels and retrains.

MultiCommManager includes a statistical analyzer for offline analysis. It comes with both graphical and text-based reports that offer historical analysis. The graphical reports provide comparative views, such as connect speeds, connection types and faults over a period of time. Call history and accounting are also available. The output, a text file, can be imported to a spreadsheet for manipulation; however, getting the files takes some work and is rather difficult to automate. Log files need to be downloaded from each controller via FTP and then processed through the statistical analyzer. Once that's done, reports can be run from the data collected. But publishing the results to the Web or


About Setup View Control Firmware Rack Tools Window Help
Explorer
Display: Current State
Diagnostic Packet Information
CD OH OTR TST QOS V.42 Fax
3K - 31.2/31.2 V.42bis
3L - 31.2/31.2 V.42bis
3M - 31.2/31.2 V.42bis
3N - Ring
3O - Ring
3P - Ring
4A - Ring
4B - Ring
4C - 31.2/31.2 V.42bis
4D - 31.2/31.2 V.42bis
4E - 31.2/31.2 V.42bis
4F - 31.2/31.2 V.42bis
4G - 31.2/31.2 V.42bis
4H - Free
5A - Up Time 1 Hours, 9 Minutes, 4 Sec
6A - PRI: Layer 1 Status: Unknown, Lay
7A - Free
7B - Free
7C - Free
7D - Free
Display
DTR DCD DSR CTS RTS
CONNECT 31.2/31.2 V.42bis
SNMP request
Selected 0 / 0 / 0

Multi-Tech Systems CommPlete's MultiCommManager interface gives detailed status views of your remote-access server.



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other information sources automatically requires considerable development work.

Upgrading the modem and system firmware is a simple process of uploading the new firmware to the RASes via FTP and then issuing a reboot. Since each RAS is in its own segment, we could provide service to users while doing maintenance, busying out the modems before rebooting the segment so as not to disrupt user connections.

The CommPlete is a mixed bag. Its statistical analyzer and Web-based management are impressive, but its archaic architecture results in a lack of hot-swappability and the need for reboots after every configuration change. ■

Send your comments on this article to Mike Fratto at mfratto@nwc.com.

Vendor Information

MAX TNT, Ascend Communications, (800) 621-9578, (510) 769-6001; fax (510) 747-2300. *info@ascend.com* or *www.ascend.com*

AS5300, Cisco Systems, (800) 326-1941, (408) 526-4000; fax (408) 526-4100. *www.cisco.com*

Tigris 7-Slot, Ericsson Access Product Division, (800) 444-7854, (805) 685-4455; fax (805) 685-4465. *info@acc.com* or *www.acc.com*

PortMaster 4, Lucent Technologies, (888) 4LUCENT, (978) 287-9000; fax (978) 287-9050. *www.lucent.com*

CommPlete, Multi-Tech Systems, (800) 328-9717, (612) 785-3500; fax (612) 785-9874. *www.multitech.com*

LanRover Access Switch DPS (Dual Power Supply), Shiva Corp., (800) 977-4482, (508) 788-3061; fax (508) 788-1539. *www.shiva.com*

3Com Total Control Multiservice Access Platform with HiPer Access System, 3Com Corp., (800) NET-3COM, (408) 326-5000; fax (408) 326-5001. *www.3com.com*

For more information on products tested in this issue, go to *www.networkcomputing.com/links.*

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ON-NET DATA SERVICES

ONE NETWORK

END-TO-END

NO HANDOFFS

by Kelly Jackson Higgins

School System Broadcasts Video With ATM/LANE

There's nothing quite like staring at a big, juicy spider, live, in true broadcast quality on a video screen. That's what middle- and high-school students in the Clermont County (Ohio) Public Schools did during a recent research project on insect classification conducted with the Cincinnati Zoo. Soon, the school system will be able to run video sessions with sites outside the county, too, thanks to its new Ethernet and OC-3 ATM-based backbone using MPEG II video compression. The new video network will have a minimum of 10 megabits dedicated for video traffic, another 10 megabits for data and the rest earmarked for future applications, such as stored video and voice over IP. The Southwest Ohio Regional Distance-Learning Network (SWORD Learning Network) spans close to 15 sites in Clermont County, including the school districts and University of Cincinnati-Clermont College and the Cincinnati Zoo in nearby Hamilton County; 10 more sites in Hamilton are scheduled to be added soon.

"Using MPEG II compression on the new network, I've seen high-quality video at even 1.5 Mbps."
—ROBERT SANDERS

Broadcast-quality video is the key to any distance-learning application. A typical videoconference can eat up about half a T1 connection on Ohio's state backbone network, for instance, and it's not broadcast quality. It's difficult to reach that kind of quality over a T1, especially if the line also is being used for data, as is the case with the state's network, says Robert Sanders, director of distance education for both the Clermont County Educational Service Center and Hamilton County Educational Service Center. "Using MPEG II compression on the new network, I've seen high-quality video at even 1.5 Mbps, with very little pixelization," reports Sanders.

The SWORD Learning Network replaces Clermont County's DS-3 service, which was tariffed by Cincinnati Bell for video-only. The move to the ATM-based service has saved the school system about $200 per month over its existing DS-3 connection, and it will save even more without the extra data lines that it required. "Depending on what a school district had for data lines, the monthly savings could range from $150 to $700," says Sanders. The key to saving money up front with ATM is avoiding the equipment costs associated with rolling your own private ATM network. The only hardware Clermont had to purchase was an Optivision codec and a Cisco 3600 router for each site—Cincinnati Bell supplied the 3Com 3000 switches, where the ATM service terminates.

But pioneering a broadcast-quality video network also has trade-offs. The next hurdle is finding a gateway to connect the new MPEG II fiber ATM network to the state's T1 ATM network, which uses Vtel equipment and H.321 compression. That way, students and teachers will be able to hold videoconferences with organizations on the state network. Voice traffic will join the network sometime next year, and streaming video is expected to follow eventually. ■

Lift facing page for centerfold. ➥

Tell us about your network

And we may profile it in a future issue. Contact Art Wittmann at *editor@nwc.com* or (516) 562-5071.

Robert Sanders

Occupation: Director of distance education

Organization: SWORD Learning Network

Years Experience: 9

Responsibilities: Scheduling video courses, writing grants, acting as liaison between vendors and integrators for the ATM and LANE-based video backbone, supervising teachers and serving as project manager for professional development opportunities on the video network.

Photograph by Rick Dieringer

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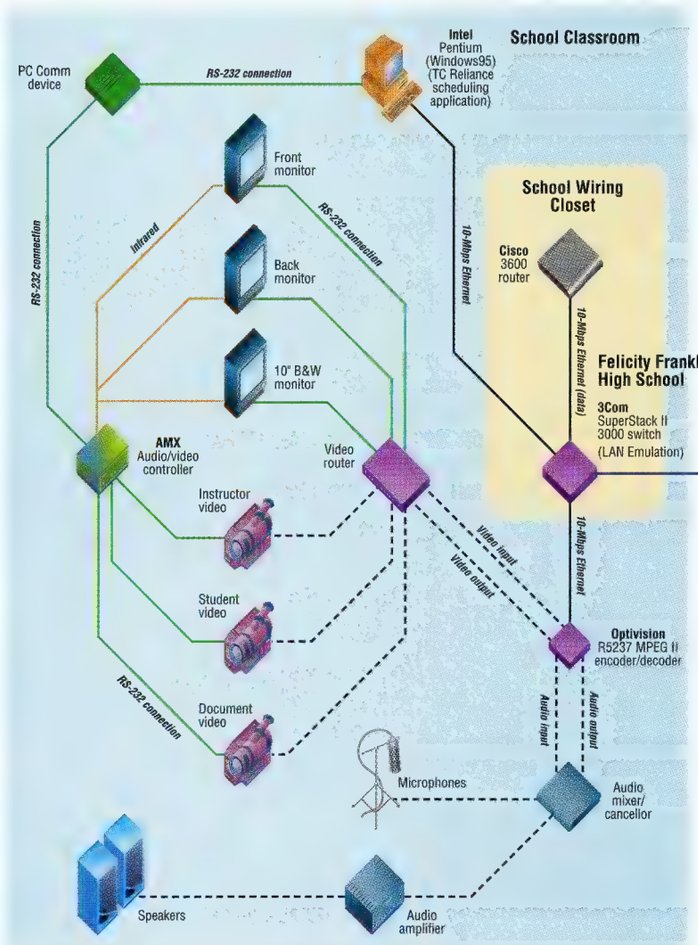
The ATM video backbone replaces Clermont County's DS-3 video-only service, and will save the schools about $200 per month compared to the DS-3 video line and up to $650 a month by eliminating unnecessary T1 data lines.

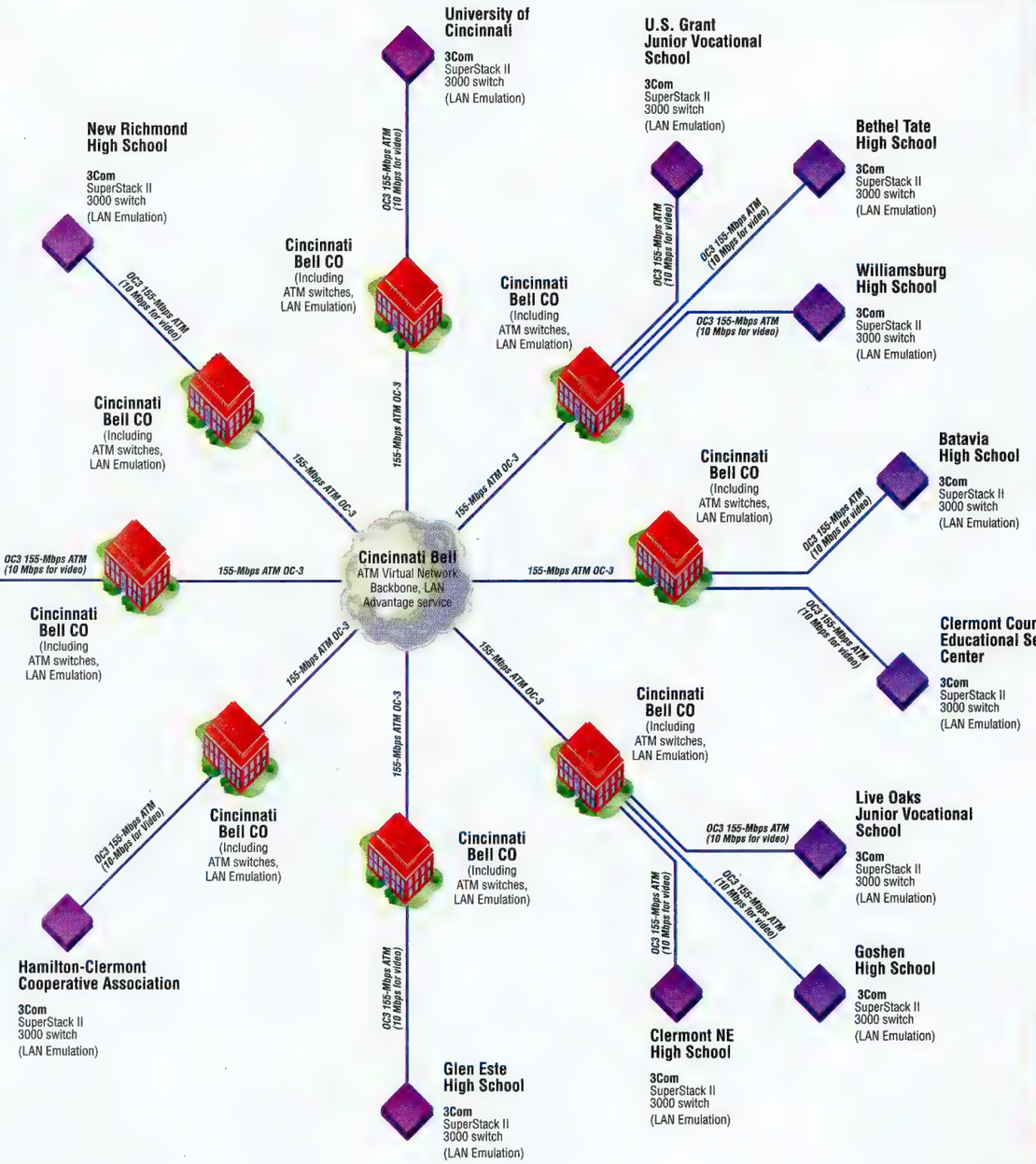
Clermont County and Hamilton County Schools

Ohio

An Optivision RS237 MPEG II encoder/decoder in each classroom handles the compression necessary to produce the broadcast-quality feed.

Typical High School





The Southwest Ohio Regional Distance-Learning Network, which is based on Cincinnati Bell's ATM and LANE service, lets students view video courses in broadcast-quality mode.

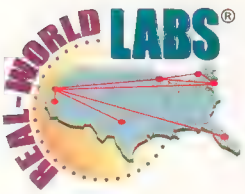
The network to date spans 25 sites—the Clermont County and Hamilton County school districts, some area colleges and the Cincinnati Zoo—and will connect with the state of Ohio's video network, too.

An ATM-based 3Com SuperStack II 3000 switch serves as the access point to the Cincinnati LAN Advantage service.

Diagram by David O. Miller/Photographs by Rick Dieringer

Trend InterScan Secures Top Virus-Protection Spot

By Jeffrey H. Rubin and Timothy M. O'Shea



Remember the good old days when network administrators in charge of virus protection dealt mostly with tainted floppy disks and corrupt .COM files? Today, viruses take many forms, from hostile applets and portable script files to embedded macros in legitimate documents. With the explosion of Internet use and the ubiquity of e-mail, attached viruses can swoop in from anywhere and quickly infiltrate a corporate network.

Before the advent of gateway antivirus products, administrators counted on client-side virus-scanning packages or, at best, server-side scanners. These solutions primarily scan for viruses that have reached company servers and desktops, both environments from which a viral infection can all too easily be unleashed sitewide. Firewall vendors have begun to offer more aggressive protection against hostile code at the gateway level, but this usually isn't a primary concern.

The bottom line is this: If your organization is serious about fighting viruses, invest in a gateway solution. Remember, too, that gateway antivirus products can only stop network-borne viruses, so you'll need to maintain your server-side and client-based antivirus solutions. And there's one more hitch—the products in this space aren't quite mature. Although the products we tested were able to fend off most of the viruses in our tests, no package had a 100 percent success rate.

We evaluated three SMTP gateway antivirus products—Command Software Systems' m@ilCOMMAND, Symantec Corp.'s Norton AntiVirus for Internet Email Gateways and Trend Micro Corp.'s InterScan VirusWall—in our Syracuse University Real-World Labs®.

We wanted to include Network Associates' offerings but were prevented from doing so by timing and the aftermath of a corporate acquisition. We put off our tests for months waiting for WebShield 4.02, but we finally went ahead without it. About the time you read this, Network Associates will have released WebShield 4.02.

The three products we tested offer real-time scanning of inbound and outbound SMTP traffic, remote management interfaces, sender/receiver notification and updated virus patterns. Other features, such as spam filtering and content filtering, are available as part of add-on packages or are being promised in upgrades. All three are ICSA-certified and are capable of detecting viruses found on the WildList. Overseen by the WildList Organization (*www.wildlist.org/WildList/199902.html*), this list is a compendium of computer

In This Section

Comparative Reviews

RADWARE FireProof 88
We tested a dynamic load-balancing firewall solution.

Report Card

Antivirus Protection for SMTP Gateways

Feature	Weight	Trend Micro Trend InterScan VirusWall 3.1	Command Software m@ilCOMMAND 1.0_7	Symantec Norton AntiVirus for Internet Email Gateways 1.0.2
Virus detection	40%	4.5	3.5	2.5
Configuration	25%	4.5	4.5	3
Logging	20%	4	5	3
Ease of use	10%	5	3	3.5
Price	5%	3	2	5
Total score		**4.38**	**3.93**	**2.95**
A≥4.3, B≥3.5, C≥2.5, D≥1.5, F<1.5 A-C grades include + or – in their ranges		**A–**	**B**	**C**

Total scores and weighted scores are based on a scale of 0-5.
Customize the results of this Report Card to your environment using the Interactive Report Card, a Java applet on NETWORK COMPUTING Online, at *www.networkcomputing.com*.

viruses reported by volunteers.

All three products displayed problems with platform support, mail relay and filtering. None detected Macintosh or Linux viruses. The control of mail relay and mail filtering was at times difficult to customize and could lead to integration headaches in scaled environments. Some of the products need a more developed interface to be useful in an enterprise setting.

Despite these weaknesses, Trend Micro's InterScan VirusWall 3.1 stands far above its competition, and takes our Editor's Choice award. VirusWall incorporates 19 compression algorithms to detect the most common methods for sending attached files. Detecting and processing 19 compression schemes means there is little chance a virus will get through. The other two packages only detected the most common compression schemes, such as TAR and ZIP.

VirusWall not only detects the most common viruses, but stays ahead of the curve by ferreting out new means of viral infection, including hostile applets, JavaScript, VBScript and the most recent HTML infectors. VirusWall detected more of these viruses and offers the only hostile-applet scanning code among the three products we tested. While not perfect, the interface was the most convenient and intuitive we saw, with only a slight learning curve. Trend Micro also offers the separate Trend Virus Control System (VCS), which provides Web-based remote administration and a slew of additional features.

It appears that Symantec's Norton AntiVirus for Internet Email Gateways and Command's m@ilCOMMAND are still in the design phase. Symantec officials told us the company plans to release an extensive upgrade next quarter. However, they declined to provide other details.

Both the Symantec and Command releases have several bugs to work out. If the version dates are correct, Norton's software has not changed since its 1.0.2 upgrade in 1997, and it was incomplete and problematic from the moment we installed it on our test system. Command's product is stronger, offering excellent mail handling and log configuration. M@ilCOMMAND also uses a comprehensive F-PROT engine for virus detection. With a little work on the user interface, Command could provide serious competition for Trend Micro.

Trend Micro Trend InterScan VirusWall 3.1

After several intensive tests in our lab, our question became "What *won't* VirusWall detect?" The answer is "not much." Trend's detection algorithms are top-notch and it's obvious that much thought went into this system's design. Despite its power, the system footprint is small and the product is quick and flexible. VirusWall's overall reliability and trustworthiness made it the obvious winner in our tests.

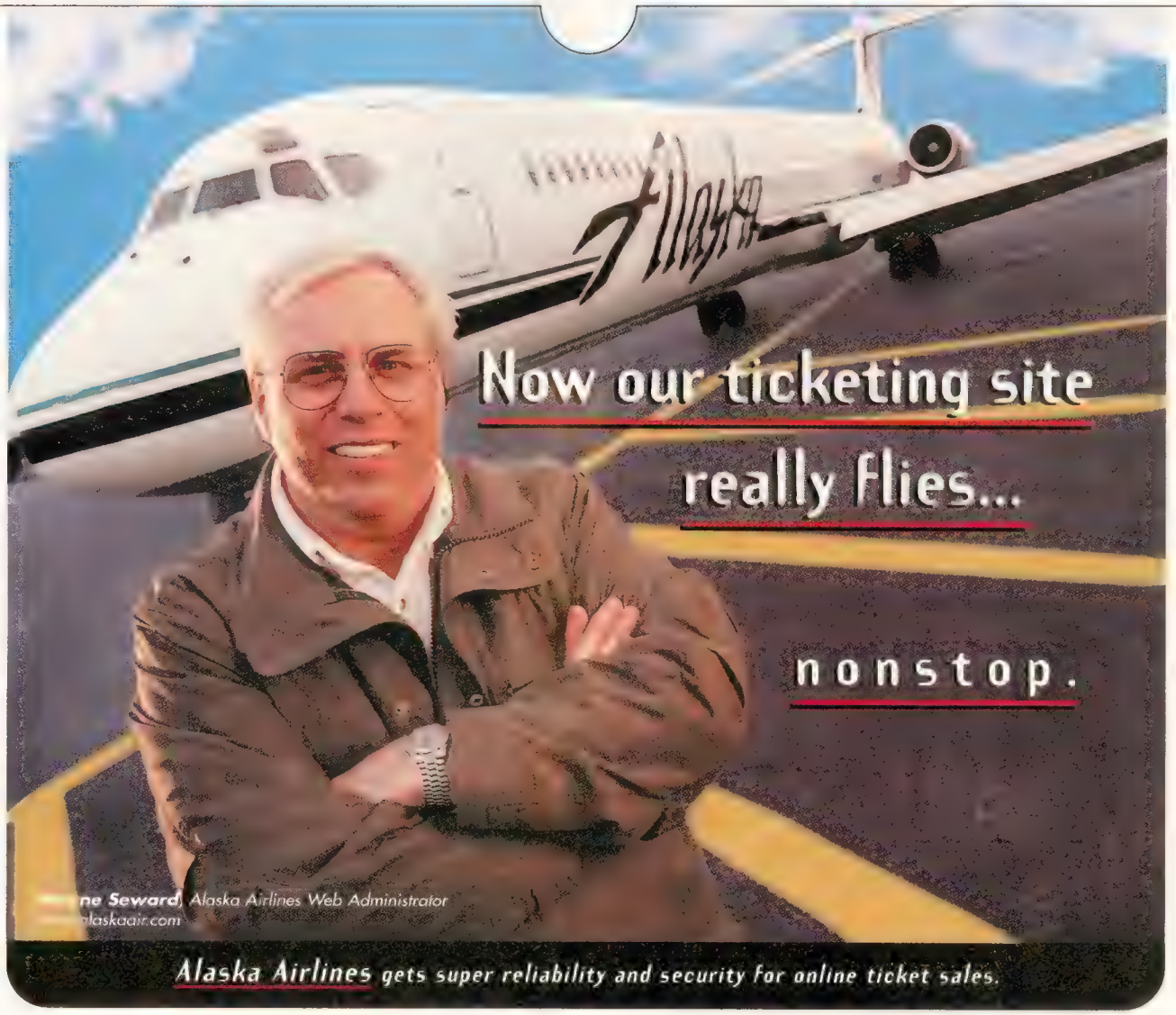
Executive Summary: Gateway Virus Scanning

Stopping a virus before it reaches your servers and desktop systems is the goal of gateway virus protection, which is fast becoming a viable means for protecting your network. Each of the three products we tested—Command Software Systems' m@ilCOMMAND 1.0_7, Symantec Corp.'s Norton AntiVirus for Internet Email Gateways 1.0.2 and Trend Micro's Trend InterScan VirusWall 3.1—boasts competent scanning capabilities for HTTP, FTP and SMTP traffic. However, our testing showed that these products share some basic weaknesses. None of the products we tested caught Macintosh or Linux viruses. In addition, platform support is uneven and the management controls are not as granular as we would like.

Detection, performance and configurability were our key measurements in determining which of the three virus protection packages offered the best defense.

Trend Micro's InterScan VirusWall earned our Editor's Choice award for its cutting-edge protection and for detecting more viruses than any other product. VirusWall was the only product we tested that was able to clean infected attachments. M@ilCOMMAND did a decent job detecting most of the viruses we sent through, but fell short on overall ease of use. We were greatly disappointed with Symantec's Norton AntiVirus—more than half of the test viruses we sent made it through the gateway.

In the future, we'd like to see these products register higher overall "catch and clean" percentages. More robust management interfaces capable of generating detailed reports about current virus activity would also be a plus.



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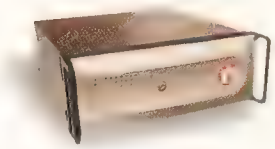

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How We Tested Antivirus Software

We put each antivirus product through a battery of tests to measure its detection, removal and notification of viruses. In addition, we looked at logging, configuration and overall performance. We installed each product on a Dell Optiplex Pentium II 300 MHz with 256 MB of RAM running Windows NT 4.0 server.

Although it is possible to run both the virus gateway and mail server on the same system, we decided to use two systems to alleviate system dependencies as well as to better gauge performance and flexibility. Additional plug-ins, software and management systems for the products being tested were not used during these tests.

Our tests attempted not only to verify the WildList certification of these products, but to challenge them with some creative real-world virus possibilities. We also ran tests on file compression, false positive scans, Trojan, backdoor, operating system, hostile applets, VBScript and HTML viruses. In addition, we used several viruses not found on the WildList, including some that have been the cause of security advisories or recently distributed.

Antivirus Test Results

		Command Software m@ilCOMMAND 1.0_7	Symantec Norton AntiVirus for Internet Email Gateways 1.0.2	Trend Micro Trend InterScan VirusWall 3.1
Test	**Description**			
WildList frequency scan	Uses January 1999 list of viruses in the wild, sorted by frequency; detection results out of 18	18/18	9/18	18/18
Compressed virus	Detects compressed or encoded test virus attached using each of the 12 forms: ZIP, ZIP-EXE, ARJ, ARJ-EXE, RAR, GZIP, TAR, TAR&GZIP, LHA, MIME, UUE, PKLITE	ZIP-EXE, ZIP, UUE, MIME	ZIP, UUE, MIME	All
Relay prevention	Prevents relaying of messages through gateway	○	○	Default
UUE in body	Detects UUEncoded virus pasted into the body of the message	Pass	Pass	Fail
MIME in body	Detects MIME-encoded virus pasted into the body of the message	Pass	Pass	Fail
False positive	Determines if legitimate macros are detected as viruses	○	○	○
Cleaned success	Determines if cleaned files are really clean and executable	N/A	○	●
Trojans and backdoors	Tests for common destructive payload Trojans, password thieves and remote-control backdoors; six in all	3/6	6/6	4/6
Mac viruses	Detects Mac viruses	○	○	○
Linux virus	Detects the "bliss" Linux virus	○	○	○
Recent/classic viruses	Detects standard viruses from the past year that were discussed in alerts or by the media	11/13	10/13	9/13
New viruses	Detects viruses released since December 1998	1/3	2/3	1/3
Macro viruses: standard Word	Detects macro viruses from the full WildList and variants	32/32	32/32	32/32
Macro viruses: standard Excel	Detects macro viruses from the full WildList and variants	4/4	4/4	4/4
Macro viruses: non-Word	Detects macro viruses aside from Word and Excel infectors (includes Access, PowerPoint and AMI Pro)	1/11	6/11	6/11
Macro viruses: new	Detects new Word and Excel macro viruses (less than four months old)	12/17	5/17	4/17
VBScript viruses	Detects eight new VBScript viruses	1/8	3/8	5/8
HTML viruses	Detects four new HTML infectors	0/4	0/4	3/4
MIRC scripts	Detects hostile MIRC scripts (mix of .exe and .ini files)	6/39	4/39	4/39
Hostile Java applets	Detects 16 .class files	0/16	0/16	11/16

● Yes ○ No

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It's not enough for network administrators to have a system that detects only the most common or oldest viral forms. In our tests VirusWall was the only product to spot hostile applets. In addition, we found the product to be on the cutting edge of malicious-code detection, spotting even the most recent developments, including threats to VBScript, JavaScript, HTML infectors, MS-Access macros and MS-PowerPoint macros. A VirusWall module is assigned applets and compares them to a known signature database for an added level of protection and validation.

Once VirusWall detected a virus, it was the only product we tested that attempted to clean the infected file. When it was successful, the newly uninfected file was sent to the appropriate recipient. If VirusWall was unable to remove the infected file, the message was deleted and an e-mail message was transmitted to the sender, recipient and network administrator notifying them that the message was undeliverable because of an infection.

We appreciated VirusWall's ability to keep or remove attachments selectively. When one file out of 10 was infected, VirusWall delivered the uninfected attachments, and cleaned or removed the infected attachment.

Also of note is VirusWall's expansive dictionary of compression routines, which was more extensive than any other product we tested. It quickly processed each of the 12 encoding/compression formats we threw at it and detected the virus-infected files within.

However, our tests showed that VirusWall isn't perfect. We were able to sneak viruses past its scanning algorithms using a few methods. First, we were able to uuencode a raw file and paste the encoded text into the body of an e-mail message. Our mail client recognized and decoded the message, presenting us with a live virus, ready to run on our desktop. VirusWall seemed to look for viral content as attachments, but not in the body of a message. Second, VirusWall did not notice any Macintosh or Linux viruses. And even with its high marks on our detection tests, VirusWall failed to recognize several viruses and Trojan horses picked up by our client-side scanners.

During our testing, we witnessed the arrival of a new virus called "happy99.exe." This program was first detected in early January. A widespread newcomer aimed at crippling Windows desktops, it attempts self-propagation by hiding in e-mail messages. Already, there have been several security advisories and user warnings

Antivirus Software Features

	Command Software m@ilCOMMAND 1.0_7	Symantec Norton AntiVirus for Internet Email Gateways 1.0.2	Trend Micro Trend InterScan VirusWall 3.1
Virus Scanning:			
Inbound/outbound scanning	●/●	●/●	●/●
DOS/Win9x/NT virus files	●	●	●
Macintosh/Linux virus files	○/○	○/○	○/○
Limit scans to specific extensions	○	●	●
Support for compressed files	●	●	●
Malicious-VBScript detection	●	●	●
Malicious-applet detection	○	○	●
Actions:			
Quarantine/move	●	●	●
Delete	●	●	●
Leave alone/report	●	●	●
Rename/disinfect	○/○	●/●	○/●
Alerts:			
Recipient/sender/administrator notification	●/●/●	●/●/●	●/●/●
Safe-stamp message	○	○	●
Configurable notifications	●	●	●
Logging and Reporting:			
Log of real-time scan results	●	●	●
Log rotation	●	○	●
Scheduled log rotation	●	○	●
Built-in log viewer/filter	○	●	●
Updates:			
Scan-engine update	○	○	○
Scheduled updates	○	○	●
One-button update	○	●	●
Miscellaneous:			
Disclaimer insert on outbound traffic	○	○	●
Relay block	○	○	●
Includes virus descriptions	○	○	●
Y2K-compliant	●	●	●
Server:			
Set maximum connections	○	○	●
Set port	●	●	●
Inbound-message cap	●	●	●
Outbound-message size cap	○	○	●
Interface for remote management	●	●	●
Platform Support:			
Windows NT	●	●	●
Unix	○	○	●
Pricing (25 users)	$838.50	$325	$725

● Yes ○ No

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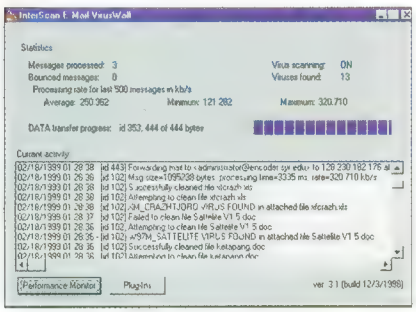
on the Internet about happy99.exe. The recent appearance of this virus allowed us to test how quickly the vendors were able to incorporate scan/clean strings into their products. VirusWall's pattern file detected the strain in its second February pattern update.

Trend Micro's InterScan VirusWall is a robust package that offers more than e-mail virus protection; it can tackle



The real-time Trend VirusWall console eliminates numerous viruses found within e-mail attachments. In addition, it alerts administrators about found viruses.

your FTP, HTTP and SMTP traffic with equal aplomb. Dynamic and current, it will provide you with the extra protection necessary to secure your network.

Command Software Systems m@ilCOMMAND

M@ilCOMMAND is a no-frills antivirus gateway. It's a good middle-of-the-road product with solid user configuration and logging capabilities. Its log files were the most detailed we saw, covering server, operations and error levels. The logs are rich in content and can be easily parsed for automated processing or precise gathering of statistics. If your taste runs to leaner logs, m@ilCOMMAND lets you configure brief, normal, verbose or debug-level logging.

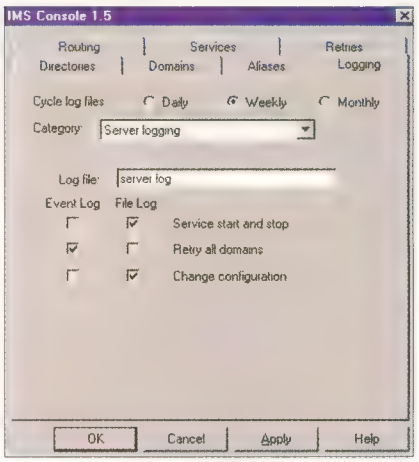
M@ilCOMMAND's strength lies in its mail-handling routines. For all configuration needs, m@ilCOMMAND uses its Internet Mail Services (IMS) console. This addition to the system control panel handles much of the necessary mail processing and helps m@ilCOMMAND integrate with almost any system. IMS tackles routing and aliases, and creates virtual domains for e-mail delivery. Using IMS, we were able to start and stop the mail services and customize log features.

Using the F-PROT Professional scan engine to detect viruses, m@ilCOMMAND scored well in our tests. All infected files are placed in a quarantine area for processing by an administrator. We deleted, sent or copied the files elsewhere via the manager.

In our tests, m@ilCOMMAND successfully detected all viruses sent from the WildList. It recognized several compressed file formats, and detected encoded messages in the body of a message, which VirusWall couldn't manage. Unfortunately, m@ilCOMMAND didn't recognize several HTML, VBScript- and Java-based viruses.

The generally strong virus-detection capabilities within m@ilCOMMAND are offset by its inability to clean infected files. If you need to repair quarantined files you'll have to buy a separate virus-cleaning package. M@ilCOMMAND adheres to the all-or-nothing strategy regarding attachments. One infected attachment leads to the quarantine of all others. We found this a bit surprising given m@ilCOMMAND's ability to parse mail headers.

M@ilCOMMAND lacks a Web interface for remote management and instead enables remote management via Windows networking. We were able to use any Windows95, 98 or NT client on the same local subnet to run the m@ilCOMMAND Manager application remotely. This interface allowed us the same functions as local management except for archiving the log files and copying from the quarantine areas.



M@ilCOMMAND lets administrators rotate their virus log files daily, weekly or monthly depending on the traffic. This helps ensure that the log files will not consume significant server space.

M@ilCOMMAND is the only product we tested that does not offer some sort of pattern update as part of the design. Instead, m@ilCOMMAND required us to log into a Web page to download packaged updates. Given the frequency of pattern updates, an automated system should be mandatory. Without a manual update of the pattern files, m@ilCOMMAND failed to recognize the happy99.exe virus.

Overall, m@ilCOMMAND's interface wasn't as appealing as that of VirusWall and Norton AntiVirus. M@ilCOMMAND encourages the use of scripted configuration files for working with the software, which we found a bit tedious. A GUI control panel is included, but the other products we tested were easier to use. M@ilCOMMAND's robust logging features, strong mail-handling configuration and excellent virus detection make it a solid choice for those eager to get down to the technical details associated with virus scanning.

Symantec Corp. Norton AntiVirus for Internet Email Gateways

Unfortunately, Norton AntiVirus for Internet Email Gateways isn't trustworthy. During the smooth program

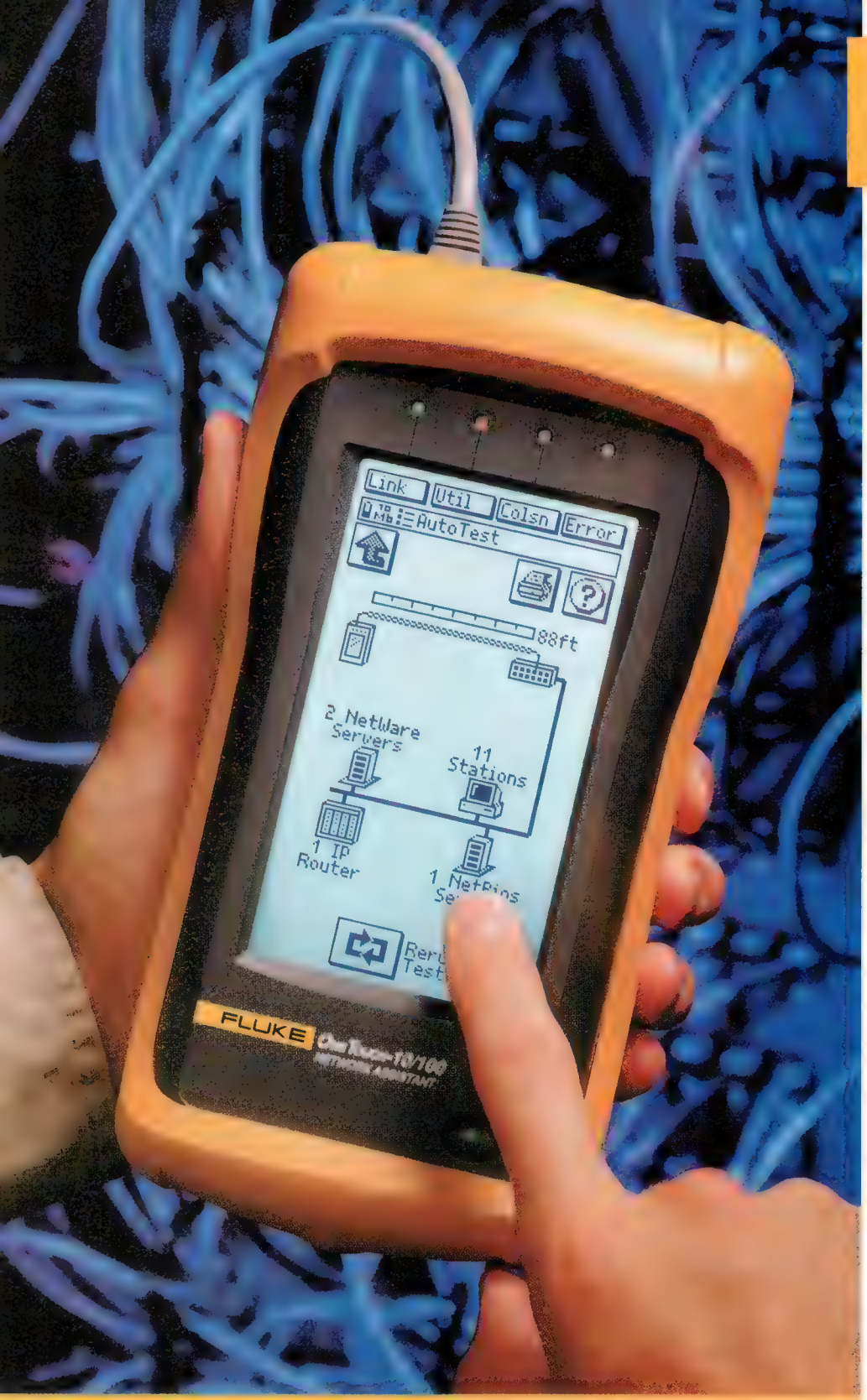
Links for Additional Information

"Wanted Dead or Alive: The Antivirus Shoot-Out" (Network Computing, Sept. 15, 1998) *www.nwc.com/917/917wgws1.html*

"Trend Micro Intros Web-Based Antivirus Control System" (*InternetWeek*, April 23, 1998) *www.internetwk.com/news/news0423-3.htm*

"Boost NT's Virus Immunity" (*InternetWeek*, Feb. 2, 1998) *www.internetwk.com/reviews/rev0202-1.htm*

"You Can Claim Victory Over Viruses" (Network Computing, Aug. 1, 1998) *www.nwc.com/914/914buyers.html*



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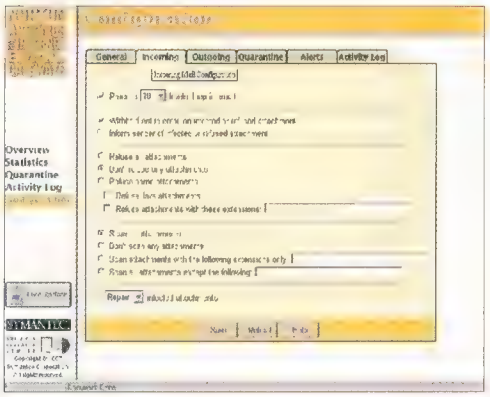

Norton's Web-based management console lets administrators specify the depth of a mail scan and which attachment types automatically to reject.

installation, we couldn't help noticing the 1996 copyright prominently displayed on the first splash screens. To be effective, virus-detection software has to be current. After installation, we selected the LiveUpdate option to get the most recent pattern strings from Symantec.

Both Trend Micro and Symantec offer automatic pattern updating to make management easier. While Trend Micro offers scheduled pattern updates, which occur without user intervention, Symantec requires the push of a button. After clicking the LiveUpdate button the program confirmed our update and assured us we were current. But upon further investigation, we noticed that the pattern files were dated 1997.

After several failed attempts in our lab, we managed to resolve the problem with a call to Symantec. The representatives were helpful and provided us with an update but no explanation. Even with the problem resolved, Norton's status window reported incorrect details about our pattern files. Only by checking file sizes and time stamps could we be sure our system had been updated.

Even the legitimacy of Norton's claim to NCSA certification seems to need updating. The NCSA was the original incarnation of the ICSA before it changed its name in 1997. In our tests, AntiVirus for Internet Email Gateways only detected nine of 18 viruses from the WildList. This sort of performance would make the product invalid for either NCSA or ICSA certification. In addition, Norton provided limited support for compressed attachments. In our tests, only UUE, MIME and ZIP files were detected. The software could not handle self-extracting archives, TAR or GZIP files.

Norton's system for scanning and handling infected attachments is a messy one. All incoming attachments are scanned as usual, but if any file in a group of attached messages is found to be infected, every attachment is discarded.

Beyond these glaring faults, the product offers a rather rudimentary implementation. A Web-based interface is the only way to configure the system other than manually editing .INI files. The Web interface can ease remote administration and is a smart option to include in any gateway scanner. But the lack of a desktop client is bothersome when working directly on the server. Our tests also showed different results depending on the Web browser we used. In some instances, Norton's quarantine window would not display on our browsers, which limited our ability to work with the product.

Norton's quarantine option seemed intuitive at first. It allows infected files to be set aside, rather than deleted, until the file is cleaned. When an infection occurs, Norton is supposed to be able to repair or strip the file. Our tests found that Norton would always strip the infected attachment rather than attempt to clean it. This proved to be a waste of system resources, and most administrators will probably disable the feature and simply delete the infected attachments outright.

In terms of virus administration, Norton's log files were *too* well-structured. The program quickly generated overly formatted logs that took a long time to load when viewed via the Web interface. The logging system also lacked any automation for log rotation or processing, which both VirusWall and m@ilCOMMAND do well.

While its virus detection is fair, Norton AntiVirus for Internet Email Gateways is lacking in too many key areas to be considered a viable option for SMTP gateways. Features like the default Web interface get a nod for ease of use, but too many bugs, quirks and problems leave this program in need of a serious update. ■

Jeffrey H. Rubin is an adjunct professor at the School of Information Studies at Syracuse University and a consultant for Internet Consulting Services. Timothy M. O'Shea is an independent consultant. Send your comments on this article to Rubin at jhrubin@internetconsult.com *or O'Shea at* tmoshea@mailbox.syr.edu.

Vendor Information

m@ilCOMMAND, starts at $838.50 for 25 users, Command Software Systems, (800) 423-9147, (561) 575-3200, fax (561) 575-3026, *www.commandcom.com* or *sales@commandcom.com*

Norton AntiVirus for Internet Email Gateways, starts at $325 for 25 users, Symantec Corp., (800) 447-7234, (541) 334-5064, fax (541) 334-7474, *www.symantec.com*

Trend InterScan VirusWall 3.1, starts at $725 for 25 users, Trend Micro, (800) 228-5651, (408) 257-1500, fax (408) 257-2003, *www.antivirus.com* or *sales@trendmicro.com*

For more information on products tested in this issue, go to *www.networkcomputing.com/links.*

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RADWARE FireProof Balances Firewall Loads With Minimal Complexity

by Gregory Yerxa

Balancing inbound or outbound traffic across two or more firewalls sounds simple enough. But try it, and you may find yourself grappling with configuration and management problems ranging from client configuration headaches to additional points of failure.

Typically, when you configure your network to pass traffic through multiple firewalls, you must set up complex router schemes or specialized firewalls. Configuring routers to load-balance multiple routes effectively also requires a proprietary mechanism, such as Cisco Systems' Hot Standby Routing Protocol (HSRP), to communicate between the routers. Some firewalls, including Check Point Software Technologies' FireWall-1, can communicate state information among themselves to achieve rapid failover with minimal loss of network traffic. To your network's client machines, however, the two firewalls appear as separate default routes and are a hassle to administer and work around as single points of failure. Keeping clients segmented into different configurations with different default gateways does nothing to load-balance traffic, nor does it offer redundancy. In the end, multiple firewalls mean lots of additional work and many more devices to manage, configure and monitor for failure.

In contrast, RADWARE's FireProof, a dynamic load-balancing system, directs traffic through the firewalls behind it and is designed to immediately detect a firewall failure. With FireProof, client configuration is identical across the network, and the entire solution is represented as a single firewall to your internal network. The addition of a second FireProof unit to your network provides complete redundancy, creating an extremely reliable multiple firewall configuration. FireProof works with any firewall, so you can keep existing equipment in place.

We tested FireProof in our University of Wisconsin-Madison Real World Labs® in conjunction with a pair of NetScreen Technologies NetScreen-100 firewalls. But before we began testing, we explored alternative methods for setting up a redundant configuration with multiple firewalls: It's not an easy task (see "FireProof Redundant Configuration" and "Alternate Redundant Configuration," page 90).

Our tests showed that FireProof is a worthwhile investment for multiple firewall installations. This completely fault-tolerant solution eases management and redundancy woes associated with complex router and network configurations. We found FireProof most well-suited for multiple firewall installations requiring fault tolerance without extensive tinkering or proprietary protocols. The extra load-balancing box that offers added redundancy is worth the $6,500-per-box price.

We set up a trusted network behind a single FireProof unit and two NetScreen-100 firewalls. After configuring the firewalls with IP addresses and default security policies, we were able to insert FireProof into the network as its new default gateway. We then directed our clients to route traffic to FireProof's IP interface and configured FireProof with the firewall IP information and weighting metrics. A one-time configuration of the hosts on the trusted network also was necessary to configure the new network's default gateway. This can be avoided by changing the IP address on the router and assigning

Report Card

RADWARE FireProof

Feature	Weight	
Reliability	30%	5
Management	25%	4
Configuration	20%	4
Performance	20%	4
Price	5%	3
Total score		**4.25**

A≥4.3, B≥3.5, C≥2.5, D≥1.5, F<1.5
A-C grades include + or – in their ranges.

B+

Total scores and weighted scores are based on a scale of 0-5.
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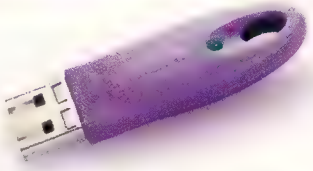

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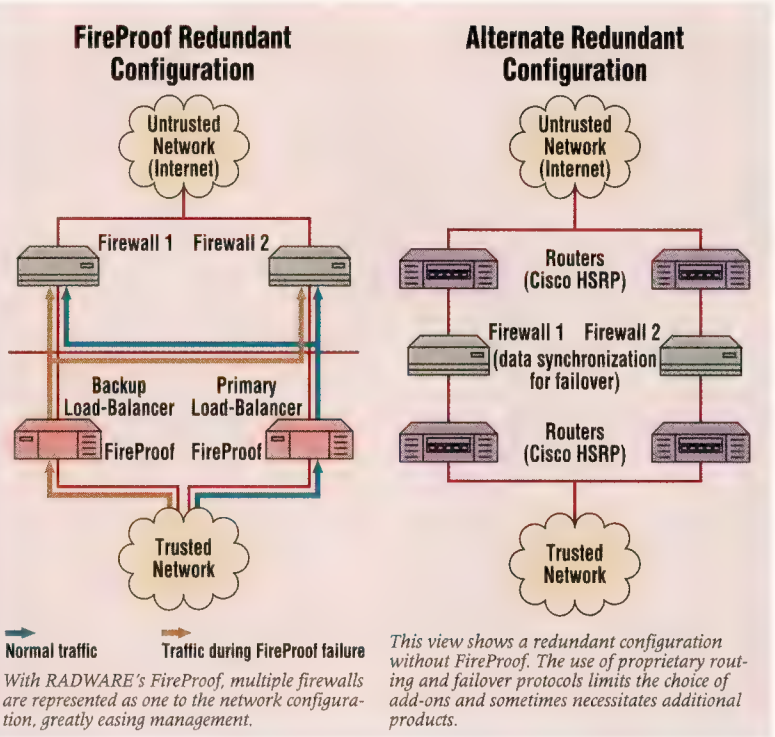
the existing default route's IP address to FireProof.

FireProof's primary value lies in its menu of management options along with its load-balancing capabilities. During our tests, we were able to add the second firewall without interrupting any traffic. Once a firewall is marked as "shutdown," FireProof stops sending traffic to it, letting you gracefully remove firewalls for service without causing any problems with client traffic.



With RADWARE's FireProof, multiple firewalls are represented as one to the network configuration, greatly easing management.

This view shows a redundant configuration without FireProof. The use of proprietary routing and failover protocols limits the choice of add-ons and sometimes necessitates additional products.

FireProof supports multiple load-balancing algorithms, including round robin (cyclic), least traffic and least users. We especially liked its support for configurable SNMP queries: It can query for private SNMP parameters from software and hardware firewalls and public SNMP parameters from Microsoft Windows NT-based firewalls, such as FireWall-1. Two separate weight schemes can be modified to suit your needs for both public and private parameters. Gauging individual firewall loads based on these parameters is more valuable than evaluating ping response times.

We managed FireProof with RADWARE's Config Master software, an easy-to-use and easy-to-navigate SNMP-based management tool. Using Config Master's real-time performance monitors, we determined the amount of forwarded traffic and number of dropped frames. Additionally, we verified client IP session information from within Config Master. However, we would have preferred a cross-platform management tool or a Web-based interface. (RADWARE says it's working on a Java/Web-based management tool.)

To test the performance and reliability of FireProof, we ran traffic-generating benchmarks and found FireProof's performance suitable for the needs of most access links with a sustained throughput of approximately 80 Mbps to 83 Mbps. We reached approximately 104 Mbps with only one firewall between the trusted and untrusted segments.

While we were testing FireProof Model C (based in the I960C Intel processor), RADWARE began shipping Model H (which is based on the I960H processor). This new model is said to be close to wire speed.

We recommend FireProof for network installations with a need for highly redundant firewall configurations with slower access links. Performance will be an issue for gigabit and some Fast Ethernet networks. ■

Send your comments on this article to Gregory Yerxa at gyerxa@nwc.com.

How We Tested

To evaluate RADWARE FireProof accurately in an enterprise environment we assembled a Class C private network. The clients consisted of nine Cubix Corp. ERS/FT II high-density server chassis, each with seven Pentium 166MMX machines running Linux. The trusted client network included a FireProof system and a Lucent Technologies Cajun P550 Fast Ethernet switch; the untrusted network was comprised of a single 3Com Corp. LinkSwitch 3300 and plugged into our network infrastructure. We conducted tests in three configurations: a single firewall, dual firewalls (clients segmented to split load equally) and a redundant configuration using the FireProof system.

Vendor Information

FireProof, $6,500, RADWARE, (800) 234-5763, (201) 512-9771; fax (201) 512-9774. *www.radware.com* or *info@radware.com*

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PROCOM TECHNOLOGY

Wireless Phones: Untethered and Unreliable

People have been hanging up on me a lot lately. I'll be in midsentence and suddenly...dead air. It's not that I'm being more obnoxious than usual, it's that I'm trying to do the impossible. I am vainly attempting to conduct business on a wireless phone that is simply not ready for business.

In the past three years, I've subscribed to five wireless phone services. I've used analog cellular, digital cellular and PCS networks. I've used systems built on TDMA, CDMA and GSM technology. My advice is to disregard all the claims various vendors make; the underlying technology doesn't set their products apart. The major difference is in the operators themselves. It's no small task to find a company offering reliability that even approaches wireline quality.

You may love the convenience your cell phone offers simply because it's the *only* thing your cell phone offers.

Now I don't want to single out any particular service, nor do I need to—it's an industrywide problem. On many online forums there appears to be a long-running contest to identify the company delivering the worst cellular or PCS service. Name an operator and you'll find unhappy customers, be it AirTouch, AT&T Wireless, Bell Atlantic Mobile, Sprint PCS, Cellular One, Omnipoint, Nextel or any other network. Each has a predictable list of complaints: dropped calls, busy network signals, phones that don't ring, incomplete coverage and/or poor in-building penetration—and those are just the most common gripes.

One reason for the increased problems is more users. According to the CTIA (Cellular Telecommunications Industry Association), wireless subscribership more than doubled between 1995 and 1998. Meanwhile, the average subscriber's monthly bill dropped 24 percent, and per-minute costs have dropped 40 percent.

You don't have to be Warren Buffett to recognize the economics. Wireless operators have modified their principal target, shifting from high-paying corporate users to consumers looking for affordable service. Because profits per subscriber are lower, operators must attract large numbers of subscribers, and quickly, so they can finance further expansion.

Wireless phone operators are pitching services to anybody who can speak, and consumers are responding. Cell phones are as mainstream as cable TV and America Online. Some parents are giving their kids cell phones when they start to drive, sometimes even earlier. At the park, I saw a 10-year-old soccer player on the sidelines, cell phone in hand, describing his big goal to dad.

You've Got Dead Air This increased load is changing the traffic patterns for which these networks were designed. CTIA's numbers show that the average call-holding time has held steady since 1988 at just under two-and-a-half minutes. But flat-rate calling plans with bundled minutes—not to mention all those teenagers—will drive up traffic and clog the system. It's what America Online discovered when it introduced all-you-can-eat pricing and the busy signal became its corporate anthem. This phenomenon has been demonstrated in other wireless markets; for instance, the story goes that parents in northern Europe began using their cell phones as baby monitors once they lost the economic incentive to hang up.

The increased number of users has made wireless telephone networks volatile. Service is inconsistent and subject to wide variations based on your location. To be fair to the operators, creating consistent service in a general-purpose wireless telephone network is one of the most difficult engineering problems. It requires an understanding of an ever-widening target population's usage patterns, coupled with random clustering effects. It may be obvious that you should build out additional capacity in Times Square for Dec. 31, 1999, but there is no way to plan for hundreds of reporters gathering around Monica Lewinsky's hotel on a day's notice. With cell sites often costing about $500,000 each, optimizing these networks is far from trivial.

Not only do wireless engineers have a substantial traffic-engineering challenge, they need to support a wide variation of aging equipment. Most networks are an amalgam of technologies emanat-

Photograph by Michael Klein

ing from a range of suppliers, each with its own performance characteristics and technical quirks. Sprint's network, touted as a unique ground-up deployment, was built with Lucent's equipment in some areas, Nortel's in others and Motorola's in others still.

One Size Fits All? Hardly For the foreseeable future, wireless telephones will be a convenience, not an essential network component. Costs will continue to fall in the effort to capture more users. The low prices may be tempting, but corporate strategists should not adopt wireless phones for critical functions, such as office lines, dispatch operations or even to replace pagers. I certainly don't want to be a patient in a hospital where doctors are summoned from the golf course via cell phone instead of by pager.

A cell phone does not replace a private radio system, a pager or a telemetry system. Stick with what works.

Recently in Washington, D.C., I was picked up by a taxi whose service was being run via cellular. The company had replaced its SMR (Specialized Mobile Radio) system with a common local digital offering. The cabbie told me that some days he would give up on the dispatch system and search for fares the old-fashioned way, at curbs and hotels.

Later that day at the ComNet trade show, getting anything but a fast busy signal using AT&T's PCS service became next to impossible. (Did I promise not to single out any vendor?) When a call actually rang through, I felt like I'd won the D.C. Lottery—or at least the Scratch and Win. A friend gloated about the superiority of his Cellular One digital service. But before the day was out, he was lined up at the pay phones with the rest of us.

As the cab company learned, it pays to stick with what works. A cell phone cannot yet replace a private radio system. It doesn't even offer the messaging reliability of most pagers. These systems can't match the remote-monitoring capabilities of proprietary telemetry networks from companies such as Cellnet Data Systems, Itron or Williams Telemetry.

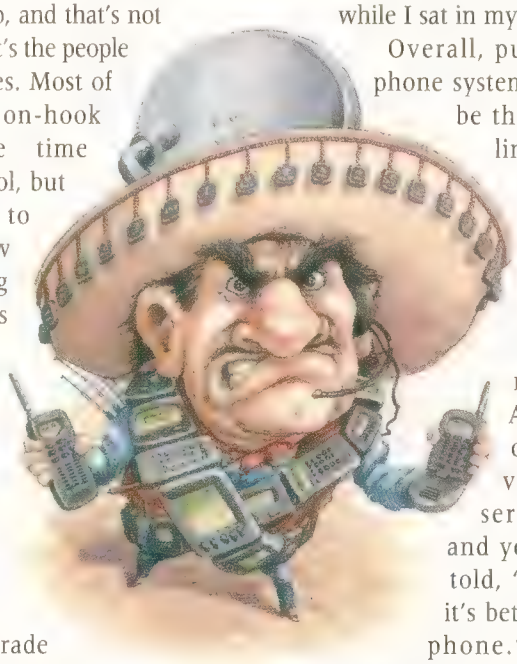
Partially due to AT&T's highly successful Digital One Rate flat-pricing plan, the Wireless Services division has been a phenomenal success for AT&T, accounting for almost half of its overall revenue growth in 1998. In my experience, call quality is hardly close to that of a wireline service. In a matter of seconds, the other party's voice breaks up, and the call gets dropped. At other times, the network returns fast busy signals when I try to dial out—this, too, is not an occasional annoyance; it happens all the time.

It's the Stupid Network, Stupid For 90 bucks a month, I expect more. So I call AT&T's customer service, and the representative tells me that maybe my dropped call was just one side or the other hanging up, and that's not the network, that's the people using the phones. Most of us grasped the on-hook concept some time around preschool, but this guy wants to make sure I know that I'm hanging up when I press the *End* key. He also explains that I won't be charged for those calls that are met with a fast busy, entirely missing the point.

A business-grade service must first be *reliable*, and the hidden message in these canned answers is that the service is not yet business-grade. AT&T's own terms and conditions recognize that the service is subject to transmission limitation and interruption, and state that the company isn't liable for any outage of less than 24 hours. While other enterprise-class carrier offerings move toward detailed service-level agreements, these contracts specify almost no service at all.

If there's something good about the AT&T Wireless service, it's the Nokia phones that are bundled with it. Incredibly, my Nokia 6160 has run for three days without any external power, setting a record for incomplete calls on a single charge. Fortunately, the phone has a display clock, so it still serves a purpose no matter where I go.

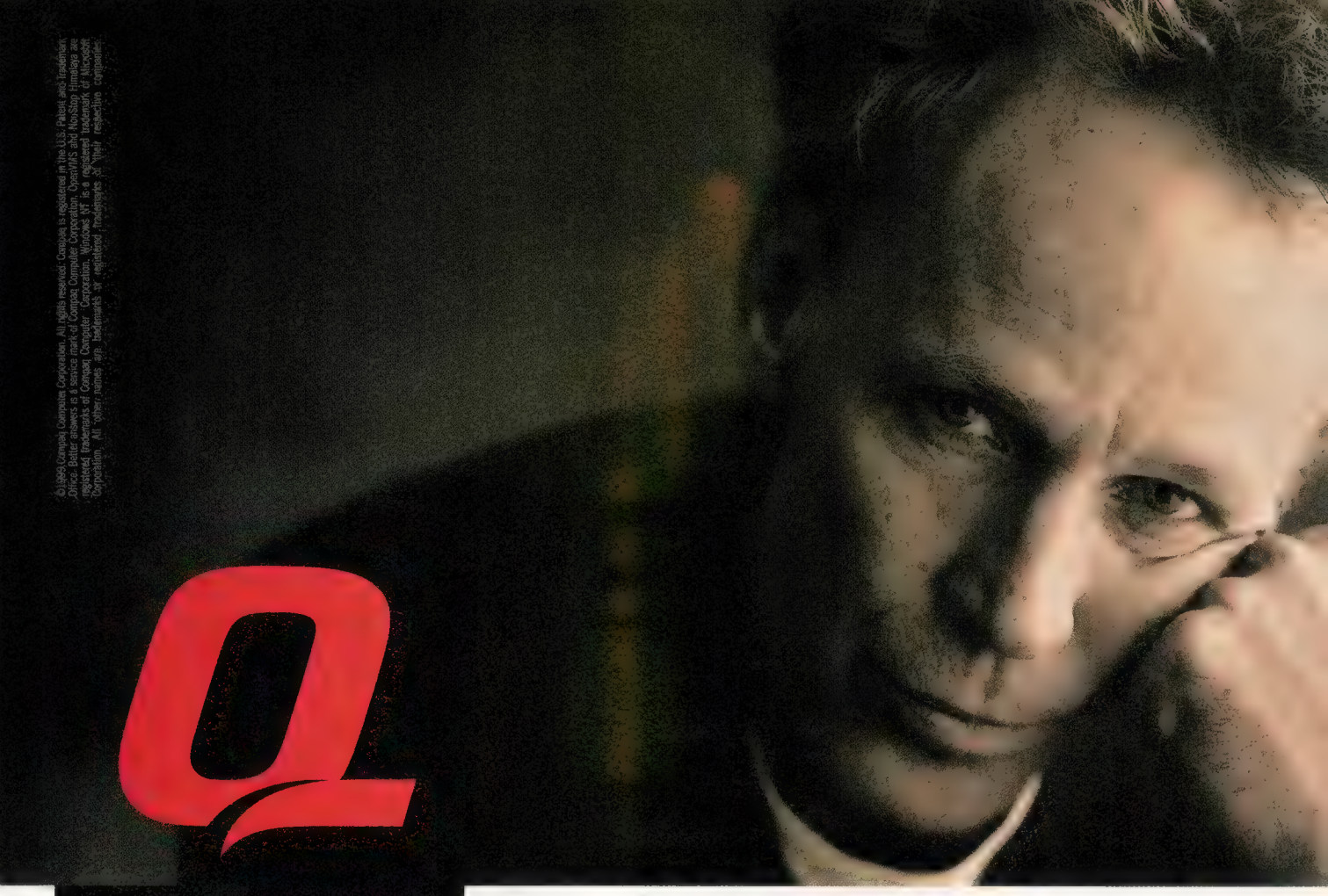
But enough about AT&T. As I mentioned, it's not the only operator with these problems. When I asked Pacific Bell about the dropped calls I experienced while driving down Highway 101, the salesperson countered that it really is best to pull over to the side of the road when making a call anyway. Sprint PCS service didn't fare much better. My phone dropped calls daily while I sat in my office.



Overall, public wireless phone systems continue to be the derelict sibling of the telephony industry, lowering the bar for quality and serving as a deflector for new entrants. Ask any voice-over-packet vendor about service quality and you'll likely be told, "Well, at least it's better than a cell phone." We should have much higher standards than this. ■

Send your comments on this column to David Willis at dwillis@nwc.com.

Illustration by Scott Pollack



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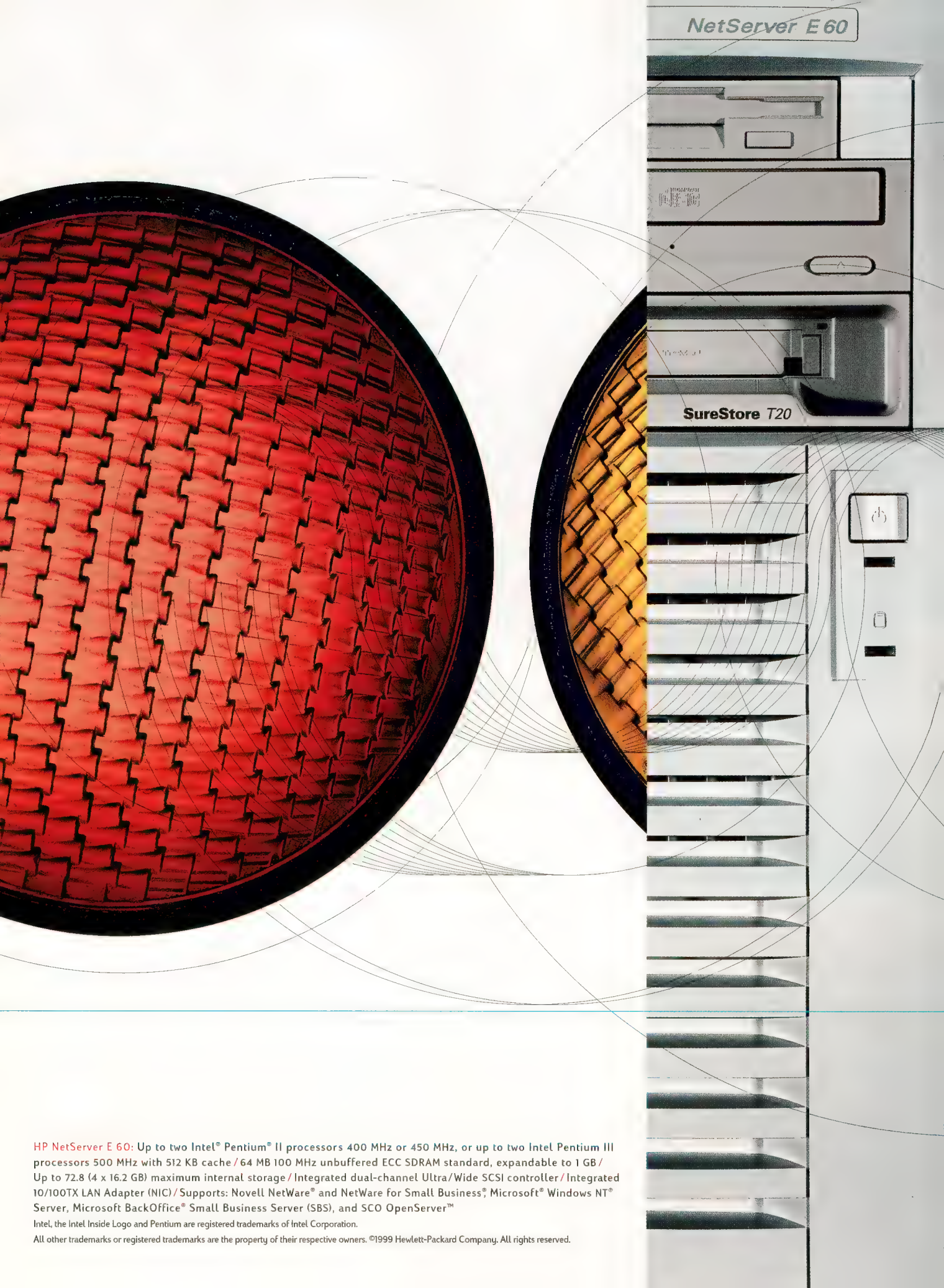

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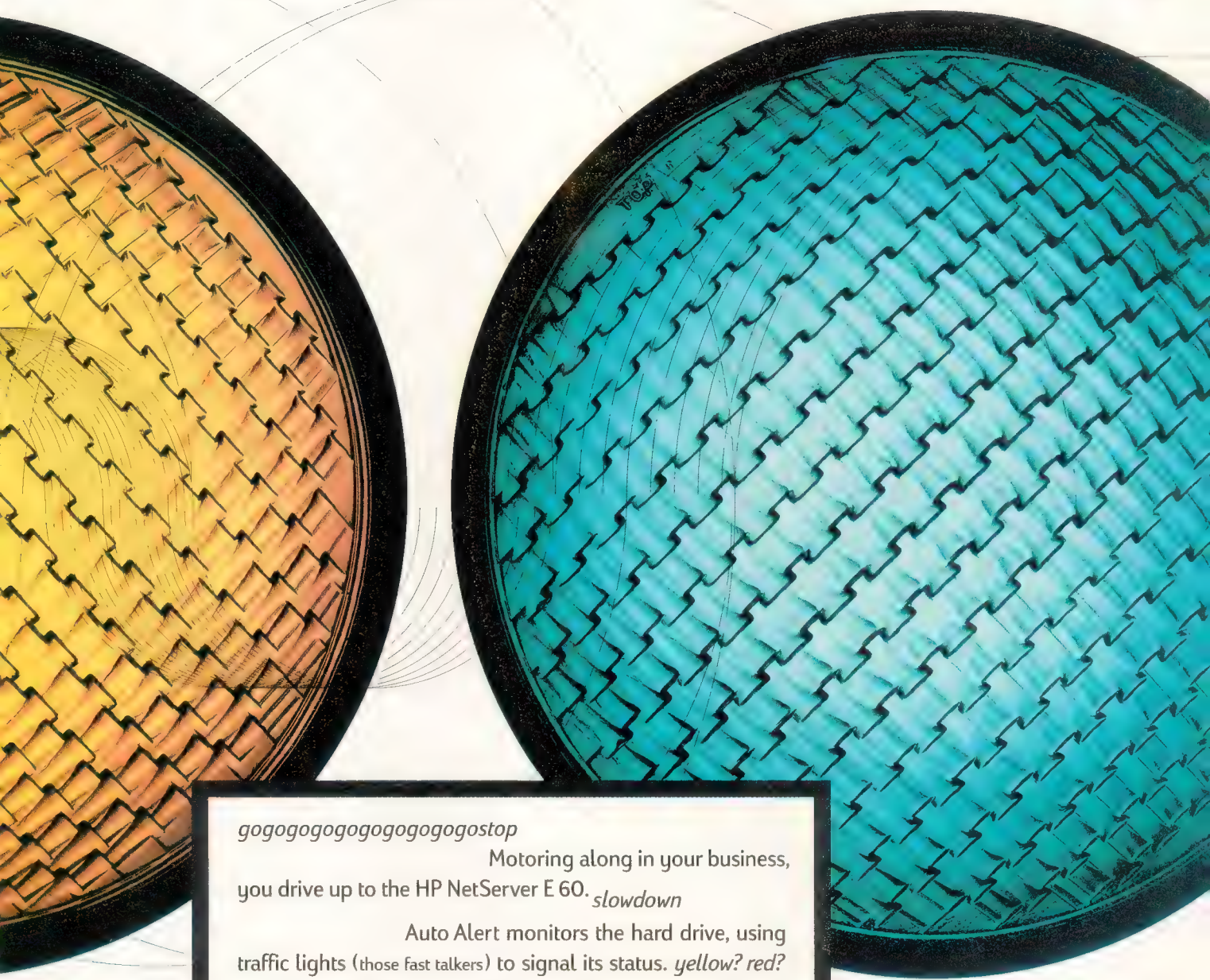

gogogogogogogogogogostop

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How To Implement SMB on Unix

by Eric Hammond

Integrating Unix and Windows systems is a pain. Administrators have multiple options for file sharing, printing and terminal emulation—but there's no cross-platform silver bullet. Several different paths make Unix file and print services available to Windows clients, including NFS, NFS gateways or SMB (Server Message Block).

NFS requires installing NFS clients on the Windows systems and running PCNFSd on the Unix server for authentication. Although NFS implementations are widespread and well understood, they still pose problems. For example, you must access every Windows client individually and manage users on both the Unix and Windows systems.

An NFS gateway, such as WRQ's Reflection NFS Gateway, is a variation on the NFS client theme. It runs on a Windows NT Server and works like an NFS client on that server, mounting NFS file systems exported from Unix and sharing them on the Windows network. This approach removes the problem of "touching" every client and minimizes the impact on the Unix server. But you'll be using two servers to do the job of one, thereby creating a potential bottleneck at the NFS gateway.

The third alternative is to install Windows networking compatibility on the Unix server, providing Windows file and print services via SMB. The appeal of this option is that you won't need to touch the Windows clients or tie up an NT server "reserving" Unix file and print services. A number of free, as well as commercial, products provide this functionality, including SAMBA, TotalNet Advanced Server (TAS), AT&T's Advanced Server for Unix and The Santa Cruz Operation's VisionFS.

For our purposes, we'll concentrate on implementing SMB on Unix using SAMBA on Solaris. Although the Unix-based SMB solutions offer different bells and whistles—for example, AT&T's Total Advanced Server provides Windows NT PDC (Primary Domain Controller) functionality and TAS offers file and print services for Novell NetWare and Apple Macintosh clients—their ability to provide SMB file and print services works much the same way across the board.

On the surface, the SMB-on-Unix solution seems very attractive, but it has its hassles. Running SMB on Unix involves some careful planning with regard to share configuration, user administration and file-name mapping. If you tackle these issues, you'll have a solid, inexpensive file and print solution without any additional hardware—and only a minimal amount of new software—on your network.

SAMBA's file and printer share configuration is straightforward, but its user administration issues raise a few eyebrows. In addition, file-name mappings become less of an issue as platforms become more well-suited to handle odd names. You may consider using a Unix server as a Windows PDC or BDC (Backup Domain Controller). Doing so offers more flexibility—you can manage as much of your infrastructure as possible on the Unix side. Although this functionality is rough around the edges in SAMBA, we'll examine the implications.

To access a copy of SAMBA, go to *www.samba.org*, which will provide a list of mirrors so you can choose a SAMBA site near you. On the SAMBA site, you'll find everything you need to get SAMBA up and running, including binaries for multiple platforms, as well as the necessary source distribution and miscellaneous tools. The SAMBA site also includes links to SMB clients for a variety of platforms.

I downloaded the source code for SAMBA 1.9.18 and later the source for SAMBA 2.0.2 from the site. SAMBA supports the GNU autoconf utility, which boils down configuration to simply running a configure script on the host. I had no trouble building the SAMBA executables on both SPARC- and Intel-based Solaris boxes.

Share Configuration Configuring file and print shares is fairly routine in SAMBA, once you've had some practice. Configuration settings are located in the *smb.conf* file. It's well documented, so you'll be comfortable editing it manually. If you run into trouble, you can access many of the configuration settings via a number of GUI-based tools available on the SAMBA site. Beginning with SAMBA 2.0, the product ships with SWAT, a

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browser-based administration tool.

A share requires a name and path and usually contains additional options, such as read-only versus write access and guest access. Like many Unix SMB solutions, SAMBA shares home directories for users that exist on the Unix system, without an individual entry for each user in *smb.conf*. It checks a share request against the shares in *smb.conf* and then, if so configured, against the list of users in /etc/passwd or in the active authentication database. SAMBA shares the corresponding home directory for that user.

Below are some hypothetical shares. The first shares one directory only:

[myhomedir]
path = /export/home/eric
valid users = eric
public = no
writeable = yes

The second shares demonstrates the [homes] section of smb.conf, a section of the file that defines SAMBA's ability to share home directories automatically. Note that this section eliminates the need for entries similar to the first.

[homes]
writeable = yes

When planning your shares, take into account that a Windows system can only include 26 drive letters. Make sure that your Windows clients don't have to consume all available drive letters for access (in the future, Windows systems also won't have an autoexec.bat file).

Printer configuration is as standard as file services: Simply attach a printer share to a Unix queue and provide the appropriate options, such as allowing guest access. You should consider whether you want to share printers from a Unix host to Windows clients. With modern printers and their network interfaces, your clients might be better off directly accessing the printers.

We Have Users? SMB solutions for Unix have a dirty little secret: User management will make you want to swerve into a bridge abutment. The most secure solution involves maintaining users on both the Unix side and Windows network, as well as managing passwords for each side. The least secure solution will never authenticate a user on the Unix side and provides every Windows user with the same access.

Until there's a ubiquitous cross-platform, single sign-on solution, user management in mixed Unix-Windows environments will consume resources. Tools are available for assistance, but they'll have you touching every client. Fortunately, SAMBA's built-in options for user authentication are a better solution.

SAMBA's functionality is threefold: It lets you provide share-level security, which authenticates all users with a single password; user-level security, which authenticates users against Unix passwords; and server security, which uses an SMB server to authenticate users. The option you choose is specified by the security parameter in the [global] section of smb.conf.

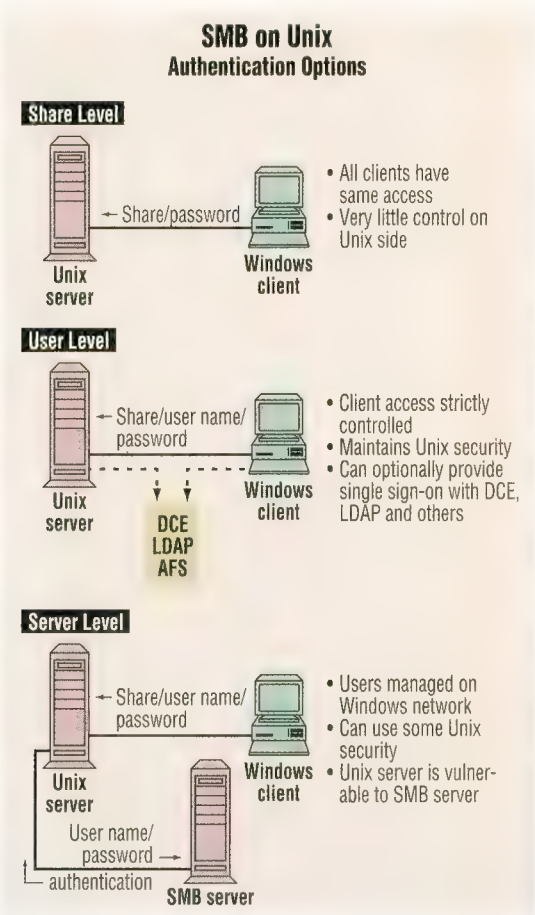
Unless you're unconcerned about file security on the Unix host, you shouldn't pursue share-level security. In addition to not mapping Windows users to Unix users, share-level security gives the same permissions to every user of the share. For share-level security, set *security = share*.

In contrast, user-level security authenticates users on the Unix host using Unix facilities. The drawback is that you'll be managing two sets of users, who in turn will have two passwords, one on the Windows network and one on the Unix host. Brace yourself for an onslaught of calls unless your Windows users are also Unix-literate.

The smb.conf setting for user-level security is *security = user*. If your Windows users are authenticating via encrypted passwords, you'll have to maintain a separate file of SAMBA-encrypted passwords on the Unix host, and set the encrypt passwords flag in the [global] section to yes. This method creates another sensitive file about which you'll have to worry. SAMBA provides a script to convert the /etc/passwd file to the SAMBA password file, but it's primitive. We had to tweak it so it would work with Solaris' shadow file, which separates encrypted passwords from the other entries in /etc/passwd.

SAMBA includes support for user authentication methods other than the Unix password database, including PAM (Pluggable Authentication Modules), AFS, DCE/DFS and Kerberos. Again, one of these options may provide a single sign-on solution, but you may need to install additional software on every Windows client.

The final method—using an SMB server (besides the SAMBA one) to au-



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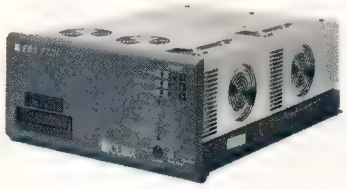

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thenticate users—is the one we find most appealing. The strangely intuitive (in terms of Unix config file standards) security value for server-level security is "server." SAMBA uses the SMB server (another SAMBA server or a Windows machine) specified by the password server parameter in smb.conf to authenticate users.

Once your users authenticate to the other SMB server, they will have access to Unix files based on SAMBA's configuration. Therefore, any attacker who compromises your authentication server will also have access to your Unix server. So your NT domain or workgroup security has to be as solid as your Unix security.

Using another SMB server for authentication fosters additional flexibility. You can maintain a set of users only on the Windows network and assign one ID to all of them on the Unix side. Alternatively, you can maintain users on both systems with identical names, but only require the users to keep track of their passwords on the Windows network. Once they authenticate, SAMBA can grant individual privileges to users on the Unix side based on their common user ID.

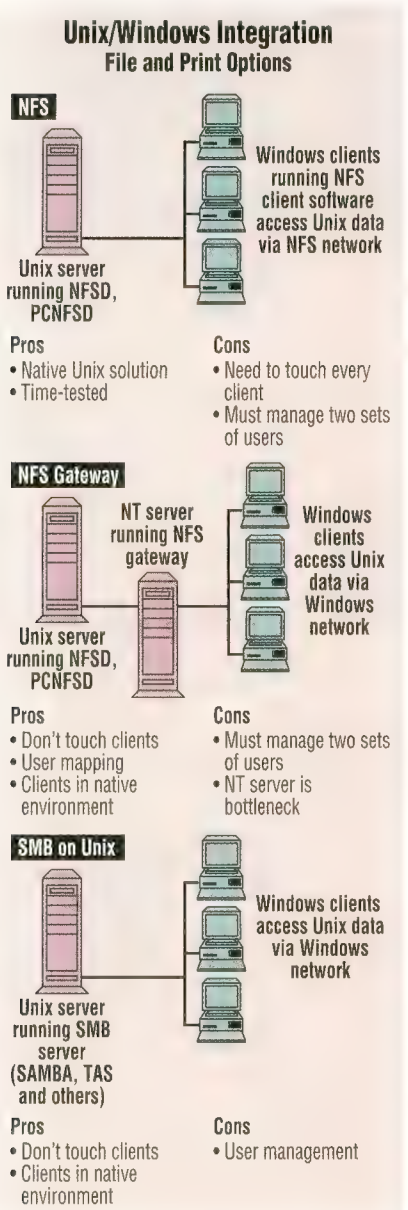
A combination of methods is also possible, in which you provide individual access to certain users while the rest fall under one Unix ID. Unix groups also offer more flexibility.

The more effort you spend creating a robust user management strategy, the easier your job as an administrator will be. You may need to create or obtain tools to manage users on Windows and Unix systems, and you will need to spend time educating your users.

Because Windows95/98 and NT support lengthy file names, many of the file-naming problems associated with sharing file systems between Unix and Windows should be minimized. For clients that need 8.3 support, SAMBA will "mangle" file names so that they'll adhere to the standard, much like Windows95/98 does in DOS windows.

SAMBA also lets you define filename maps (for example, to map *.html on the Unix side to *.htm on the DOS side). Like NT, version 2.0 is by default case-insensitive, but it retains the case of the file name for display. If desired, you can change this on a share-by-share basis in smb.conf.

The domain controller question is an interesting one for SMB solutions on Unix: Can a Unix machine act as a PDC or BDC in a Windows NT domain? AT&T's Advanced Server for Unix offers complete NT Server functionality for Unix platforms as the result of an agreement between Microsoft and AT&T. Consequently, AT&T has access to the NT source code.


Unix/Windows Integration
File and Print Options
NFS
Windows clients running NFS client software access Unix data via NFS network
Unix server running NFSD, PCNFSD
Pros
• Native Unix solution
• Time-tested
Cons
• Need to touch every client
• Must manage two sets of users
NFS Gateway
NT server running NFS gateway
Windows clients access Unix data via Windows network
Unix server running NFSD, PCNFSD
Pros
• Don't touch clients
• User mapping
• Clients in native environment
Cons
• Must manage two sets of users
• NT server is bottleneck
SMB on Unix
Windows clients access Unix data via Windows network
Unix server running SMB server (SAMBA, TAS and others)
Pros
• Don't touch clients
• Clients in native environment
Cons
• User management

Links for Additional Information

"NFS Gateway Products for NT: A New Spin on NFS to the Desktop" (Network Computing, June 1, 1998) *www.nwc.com/910/910r2.html*

"NFS: Hunting for a Cross-Platform File System" (Network Computing, July 1, 1998) *www.nwc.com/netdesign/nfs3.html*

"Freeware Samba Connectivity" (*InternetWeek*, Sept. 21, 1998) *www.internetwk.com/links.samba.htm*

"Red Hat Linux: Almost Free, and Full of Functions" (*Information Week*, Nov. 16, 1998) *www.informationweek.com/709/09olred.htm*

"Making NFS Work on Your Network" (Network Computing) *www.nwc.com/netdesign/nfs3.html*

Other offerings, including SAMBA and Sun's Solaris, are beginning to boast PDC functionality—but don't scrap all of your NT servers just yet. PDC isn't fully implemented on either.

The Bottom Line Integrating Unix and Windows has been a long struggle. Vendors on both sides are waking up to the need for seamless communication between these two platforms. In addition, the open-source community has provided several excellent solutions, including SAMBA.

CIFS (Common Internet File System), the next generation of SMB, promises to further ease file sharing between Unix and Windows. It is supported by SAMBA and other products and will run natively on TCP/IP, which should make network connections more reliable and WAN connections more feasible.

Implementing SMB support on Unix makes Unix resources available to Windows clients with minimal client-side intervention. By carefully planning the implementation of a product such as SAMBA, you can ensure reliable, secure access for your users. ■

Eric Hammond is a Web developer and freelance writer based in Denver. Send your comments on this article to him at ehammond@earthlink.net.

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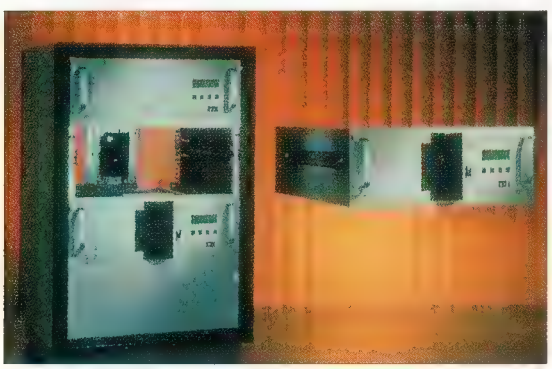
DLT TAPE

Get It on Tape: Backup That's Faster, Cheaper

by Dave Fetters

With the year 2000 fast approaching, it may be time to blow the dust off your tape backup unit and re-evaluate your storage capacity, performance and reliability needs. While performing a system backup can be an arduous task, advances in backup technology have alleviated much of the pain with smaller, faster and less-expensive drives offering hassle-free maintenance.

In the past, maintaining a perpetual library of updated data was both labor-intensive and expensive. The shortcomings of the small-system tape standards gave way to the tape technologies of DLT (Digital Linear Tape), DAT (Digital Audio Tape), AIT (Advanced Intelligent Tape), QIC (Quarter-Inch Cassette) and 8-mm helical scan. The most important factors to consider when purchasing a new drive are software compatibility, bandwidth, capacity and duty cycle.



Overland Data's LibraryXpress is just one of the many tape backup units featured in our Interactive Buyer's Guide at **www.networkcomputing.com/1007/1007buyers.html.**

Your Tape Technology Choices The heart of any tape backup system is the drive and its underlying technology. Two of the most important characteristics of a drive are tape capacity and transfer speeds. Tape-drive seek speed and reliability are also important characteristics, with the former impacting performance and the latter affecting media quality. Your decision should start by evaluating tape technologies that are viable solutions for your application. If you have a backup software package, or have one in mind, make sure the drive you choose is in the compatible list.

DLT is the leading tape backup technology for a mid-sized network. DLT technology is far from new—it's been around for nearly 20 years. But it wasn't until Quantum Corp. revised the technology a few years ago that DLT made its mark. Quantum's DLT line includes the DLT 4000 and DLT 7000. The DLT 4000 series offers 20 GB of native storage with a transfer rate of 1.5 MB per second. While the DLT 4000 units are strong and efficient, the headliner is the DLT 7000. The DLT 7000 group of products boasts one of the highest single-cartridge data capacities—35 GB—and the fastest sustained transfer rate—5 MB per second. Capacity and throughput can be doubled effectively to 70 GB and 10 MB per second, respectively, in compressed mode. DLT drives reach such a high transfer rate by implementing a serpentine method to write to the tape. The data is written on tracks that span the length of the tape. When the tape is at the end, data is written to the next track directly above and in reverse order. This eliminates the need for the tape to rewind and start the next track.

DLT also has unmatched reliability, with recording head life of more than 30,000 hours and media durability greater than 1 million media passes. DLT drives are designed for intensive use with an MTBF (mean time between failure) of 200,000 hours at 100 percent duty cycle. DLT drives can accomplish such high reliability through the use of low tape tension and stationary heads. With its performance and capacity, DLT is ideally suited to migrate large amounts of data when the backup window is small. But DLT drives are the most expensive drives of all the technologies.

DAT Price Is Right When price is a major factor in considering a tape backup unit, a popular choice is DAT. A DAT drive and its media can be purchased for a third of the price of a DLT drive and its media. DAT uses similar 4-mm media to that found in audio applications but also uses a higher-quality tape that must adhere to ANSI standards for BER (Bit Error Rate). DAT drives go by the DDS (Digital Data Storage) naming scheme. In the enterprise environment, the DDS-3

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format has been gaining ground. But DAT drives still fit best in a workgroup environment. With a compact 3.5-inch form factor, DAT drives give you greater flexibility when it comes to finding a place for mounting. Unlike DLT's multiple host interfaces, DAT drives suffer some inflexibility because they typically offer only a SCSI-2 interface. Additionally, with 12 GB of native storage and a sustained transfer rate around 1 MB per second, performance is respectable but much slower than that of DLT drives. In a workgroup environment, however, the transfer rates of DAT are more than adequate. An important consideration when looking at DAT drives is the amount of time the drive will be in use. Like DLT, DAT drives have an MTBF of approximately 200,000 hours, but MTBF is calculated around a 10 percent duty cycle. The media tapes are also not as resilient as DLT tapes, and keeping the heads clean in a DAT drive is imperative to maintain error-free backups. So if you are running continuous 18-hour system backups, give strong consideration to a DLT drive.

Going Head-to-Head With AIT The biggest competitors to DLT are AIT and 8 mm. With tape storage densities equaling those of DLT at 35 GB per tape and sustained transfer rates of 3 MB per second, Sony is making a strong showing with its AIT technology. Additionally, the price for AIT drives and media falls below that of DLT but is significantly above that of DAT drives. AIT offers an MTBF of 250,000 hours and media is rated for 30,000 passes. Similar to DAT drives, MTBF is calculated at a 20 percent duty cycle, so reliability is inferior to that of DLT drives.

One of the big advantages of using AIT over DLT drives is MIC (Memory in Cassette). The MIC hardware consists of a 16-Kb EEPROM that is mounted within the data cartridge. Using a serial interface to the memory chip, AIT drives are able to store and retrieve drive and user-generated information directly from the chip, resulting in faster data access. In some cases, the use of the MIC cuts seek times in half. AIT drives are also more reliable than DAT drives because they don't require periodic cleaning. The drive constantly monitors head output to check for possible contamination and invokes the built-in Active Head Cleaner as necessary. AIT is ideally suited for high-performance light-duty backup.

Exabyte Corp.'s Mammoth drives are similar to AIT drives in that they both use 8-mm media. However, Mammoth drives do not use MIC. They use a built-in dynamic head cleaner. Additionally, the MTBF is rated at 250,000 hours at 20 percent duty cycle with 3-MB-per-second transfer rates. The media holds a bit less than DLT or AIT at 20 GB native and the media is only rated at 20,000 passes. Mammoth drives are high-quality and designed for reliability, but these attributes hit hard in the pocketbook. A Mammoth drive can cost as much or more than many DLT drives.

Finally, just when we all thought QIC drives were all but dead, Tandberg Data has breathed new life into them with its MLR (Multichannel Linear Recording) technology. MLR achieves higher densities and faster performance than previous SLR (Scalable Linear Recording) drives by writing parallel tracks to the tape at the same time. Tandberg has a drive that can hold 25 GB native while performing sustained transfer rates of 2 MB per second. Unlike DAT, AIT and Mammoth drives, the Tandberg MLR drives are designed for heavy-duty cycles. With an MTBF of 300,000 hours at 100 percent duty cycle, the MLR drives are theoretically more durable than DLT drives, and they cost less.

If routine backups exceed the size of the backup media, it may be time to automate to avoid having to swap tapes manually midway in a backup. There are three basic types of hardware technologies: libraries, autoloaders and stackers. A stacker feeds tapes in sequential order while an autoloader and library allow random access to media. Additionally, libraries generally contain two or more drives. What really counts in an automated backup system is the average time it takes to load a tape and the reliability of the mechanics—the MEBF (mean exchange between failure).

(The biggest competitors to DLT are AIT and 8 mm.)

Stackers and autoloaders contain only a single tape drive with five to 15 tape slots. Both can be configured to use a tape a day, requiring human intervention only once a week to change tape magazines. If occasional data retrieval is common, you'll be better off with an autoloader rather than a stacker because it can randomly access the tape slots, cutting tape access time as much as fifteenfold.

If more than just occasional data retrieval is common, a library is a better solution than an autoloader. Tape libraries can contain as many as seven or more tape drives and usually house 15 to 100 tape slots while storing more than 3 TB of uncompressed data. Tape libraries can concurrently use all the drives and, when equipped with seven drives, produce an aggregate sustained throughput of 35 MB per second. With that much data running through the pipe, the SCSI interface becomes the bottleneck. It is a good idea to limit a single SCSI channel to only two tape drives. Many libraries have multiple SCSI ports to address this issue. Fibre Channel is becoming the preferred host interface, alleviating any bottlenecks with its 1-GB throughput capabilities and the ability to span more than a kilometer from the backup server. ■

Send your comments on this article to Dave Fetters at dfetters@nwc.com.

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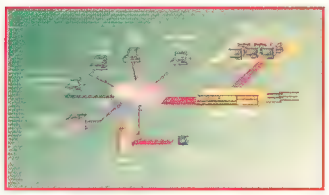

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WINDOWS NT® IN THE ENTERPRISE

Runnin' On NT

by Ross M. Greenberg

SQL Has Grown Up

I'm a programmer from way back. That was back in the days when nobody could figure out what to do with that extra 64KB bank of memory. Over the years, I've written a SCSI driver for my boat anchor S100 system and I've flipped switches to load the Bootstrap loader. From past experience, I've found that there are only a few things that have always held true: there's never enough memory, the next release will fix any problem, and Real Programmers Would Never Do SQL.

Here's a wakeup call. Have you looked at "real" programming languages lately? Something pure and pristine like C has mutated into an object-oriented monster known as C++, which has since been castrated into Java. Old COBOL programmers are pulling down a quarter-million a year retrofitting code they wrote as young whippersnappers to work with Y2K. And SQL has gotten some real power. SQLers will say it has simply matured or that its power is only now being noticed, of course.

Things have changed since I was a kid.

This is exemplified by the close wedding of NT's SQL Server, with some native NT features—such as NT's sophisticated security access system and its networking abilities—allowing OLAP Server to provide nearly painless trend analysis. NT shows off its strength by furnishing many of SQL Server's features on an OS-based services level, or by implementation of a public API (called OLAP DB) allowing third party applications to view and analyze information managed by OLAP Services. This is really powerful stuff and it all used to require dedicated mainframes.

"I have a fast Pentium III, with 160Megabytes memory and a fast 20 gig SCSI hard-disk due in

WINDOWS NT IN THE ENTERPRISE

next week," said John Adobe, IT Manager for Datamart, a data warehousing agency in Paramus, NJ. "I now have sufficient power to run not just SQL, but something massively good, such as SQL Server Version 7.0. Heck, I'm running multiple Enterprise Data Warehouses on my desktop and my system isn't even breaking a sweat. I threw in some network cards, some cheap coax and poof! I'm a complete data center."

Now that the hardware is up to the task, IT managers are quickly discovering what happens when NT and SQL Server are allowed to play together. One network administrator for Mobil Oil said the union between NT's "out of the box" networking combined with its "solid security and SQL's exposed APIs is a match made in my datamart/warehouse heaven. I'm responsible for quite a bit of application programming taking advantage of its strengths."

Good data warehousing, however, requires a little more than simply throwing together some hardware, some software, and some connectivity. It still needs some expertise in putting together workable schemas, realistic indexes and foreign keys and more.

Putting two enterprise-level data warehouses together in today's era of mega-mergers can get very complicated and Fran Dissler, Schema Manager for Boston-based consulting firm Reilly-O'Donnell, encourages admins to not skimp on the upfront effort. "More than anywhere else, planning is essential. Oftentimes, a complicated JOIN to form a new database structure can save you a ton of SELECTs only a short time down the road—but only if planned and designed well, and well in advance."

The big enterprise-level JOINs and MERGEs are still record or row-lock bound, after all, and disk speeds can still effectively knock a database off-line until done. It's not something you want to do multiple times, or to get wrong even once. And a lot of companies are discovering that what looked simple at first can quickly grow into a true DP nightmare monster when brought up to real-life scale.

Scott Crownover, project manager of data warehousing for Denver-based global environmental engineering firm CH2M Hill, recently was reminded of SQL's multi-platform challenges. His prototype-turned-production warehouse was small—barely 5-GBytes—and it resided in Oracle. He chose Informatica's PowerMart as his extraction/transformation/load tool instead of using SQL7's Data Transformation Service, mostly because of PowerMart's robustness.

But because PowerMart's $55,000/license fee is so expensive, Crownover only licensed it for Oracle. That decision will force him to "suck the data out of the store into SQL7 using DTS and then fracturing it into data marts so that we can take advantage of SQL7's Plato."

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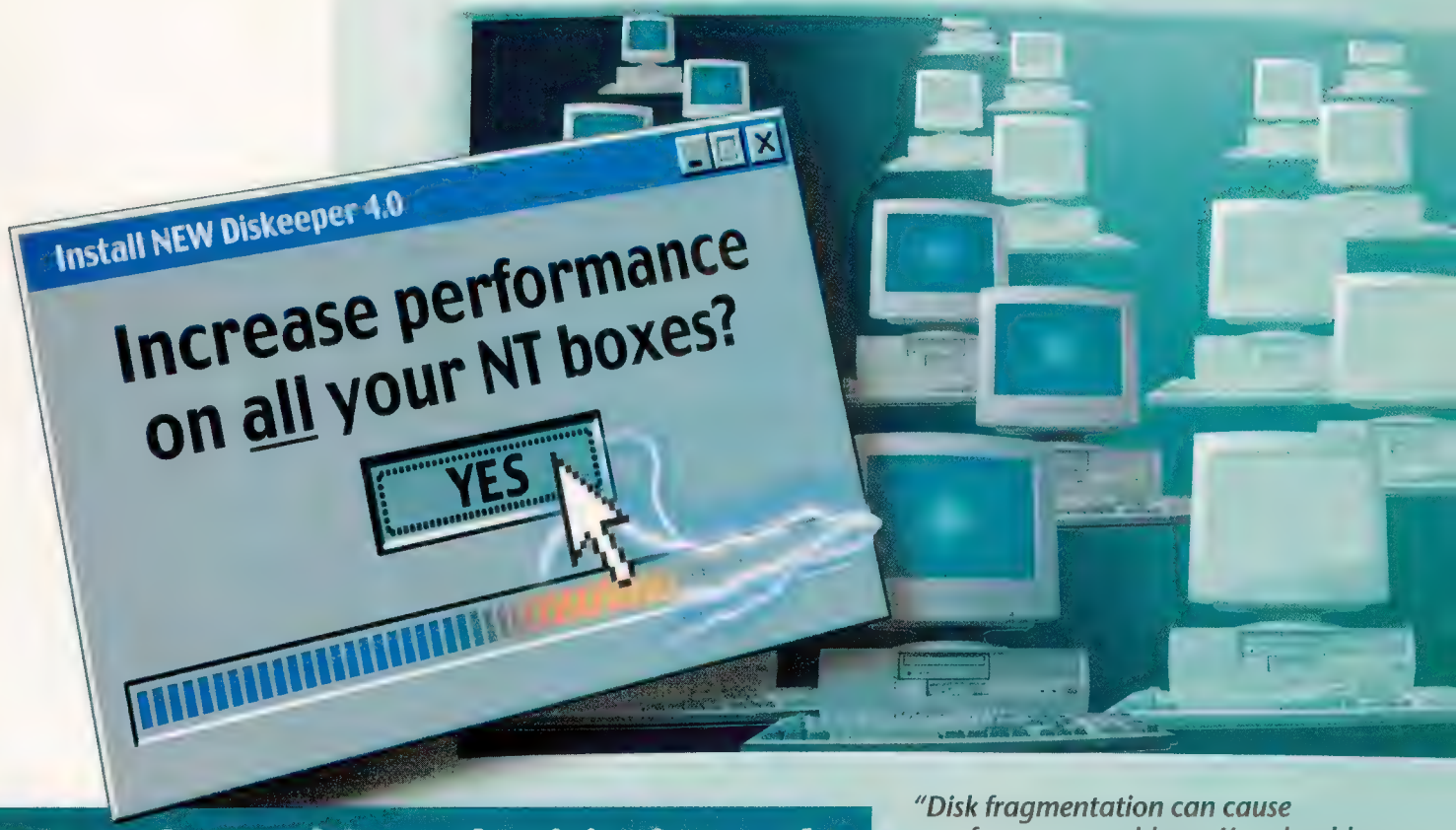

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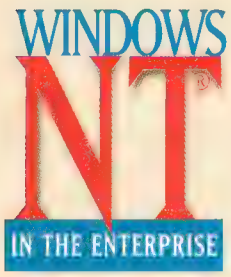

CH2M will then publish most of the datamarts via the Web, but incompatibility problems between SQL7 and Oracle8 stores will force Crownover to rely on Microsoft's tools integration. "We would have saved bundles of money using DTS to do the initial extraction and transformation, but that would have required a lot of our own coding," which would have defeated much of the purpose in changing tools. In addition, he found the GUI of DTS somewhat immature for his purposes, and preferred PowerMart's scheduling tools, finding them to be more robust than SQL7's DTS tools.

These problems "will be minimized if not removed in the next 12 to 18 months, with DTS quickly surpassing PowerMart, but only if Microsoft ties the functionality of MS Project Manager into DTS's scheduling engine." That is easier to do today because of SQL7's Component Object Model (COM) heritage. COM provides for exposed hooks or APIs to many of the internal workings of a variety of Microsoft products, with DCOM (Distributed COM) and COM+ providing much the same services across a network and into Windows 2000.

Despite its limitations for complicated extractions, DTS does a great job in a 'data pump' sense.

"It was the price tag that attracted us to SQL7 more than anything else. And you get so many tools with it, too," Crownover said. Plato, the Microsoft codename for its OLAP Server, "looks like a pretty good front-end tool at an extremely good price per seat. And DTS, despite its limitations for complicated extractions, does a great job in a 'data pump' sense."

Many users have found upgrading from SQL 6.5 + SP4/SP5a to SQL7 a good experience, with improved reliability and stability. But they also discovered the need to test some of their SQL 6.5 applications on a test machine immediately after upgrade and before full deployment.

That's very sound advice because SQL7 has a substantially different file structure for its database and on-disk key and index structures, requiring a one-time, one-way conversion, made easy through a wizard supplied with SQL7.

Although SQL7 is supposedly downward compatible with SQL 6.5, that compatibility might only be on the actual database level. Stored procedures, complicated triggers and so forth might not make the upgrade properly. Be warned: downgrading back to 6.5 is not without its share of problems. I have yet to meet anyone who has found a foolproof way of downgrading, aside from restoring from full backups, potentially losing all the interim transactions. Incompatibilities may not show up for quite a while, making an upgrade of your enterprise data warehouse a very exciting event or the cause of a few unplanned lost weekends.

One DB consultant from Melbourne, Australia, did find some shortcomings in SQL7, though. He said he thought capabilities were missing in the VLDB [Very Large Data Base] and in the areas dealing with a large number of concurrent users. "Some of the things missing, for example, include table and index-based partitioning, hashed indices (both of the scattered and order variety), better log file management and better tools to manage databases with 500 or more concurrent users."

And what is on his wishlist for future SQL versions? "Much better domains and constraints and I don't want them limited to PK/FK/Simple CHECKS. The constraints should be able to reference other tables as part of SELECT and should either be evaluated immediately—as is the current case—or later at transaction COMMIT time. Cascading FK/PK constraints are a must, too."

He also welcomes the future inclusion of dynamic database page size configuration, at least on a per database basis if not per file/group. It also needs a better Transact SQL stored procedure debugging/development environment, including user-defined T-SQL and C++/VB functions callable from T-SQL such as debug and development of their various constraints.

Those are pretty tall orders for the next SQL, especially when the magnitude of change between 6.5 and 7.0 is considered. This is all a whole new language for me. I have a lot to learn. Constraints and triggers. All in a procedural database language? This is not your father's dBase, is it?

Ross M. Greenberg, a software author of communications, security, and ActiveX controls, owns the firm Software Concepts located in the middle of the Catskill mountains. His opinions have appeared in a wide-range of technical and consumer publications.

(Any questions, thoughts, comments or suggestions for this column? Please E-mail ***ntcolumn@cmp.com****)*

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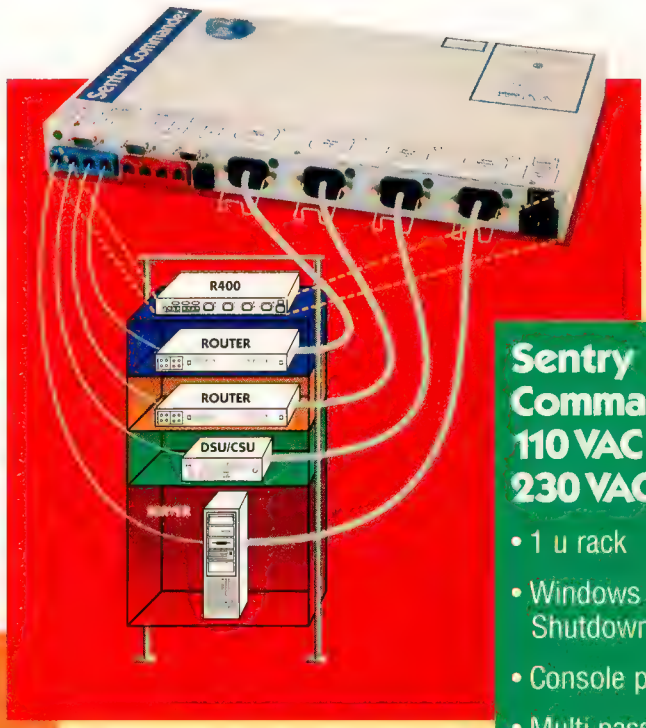

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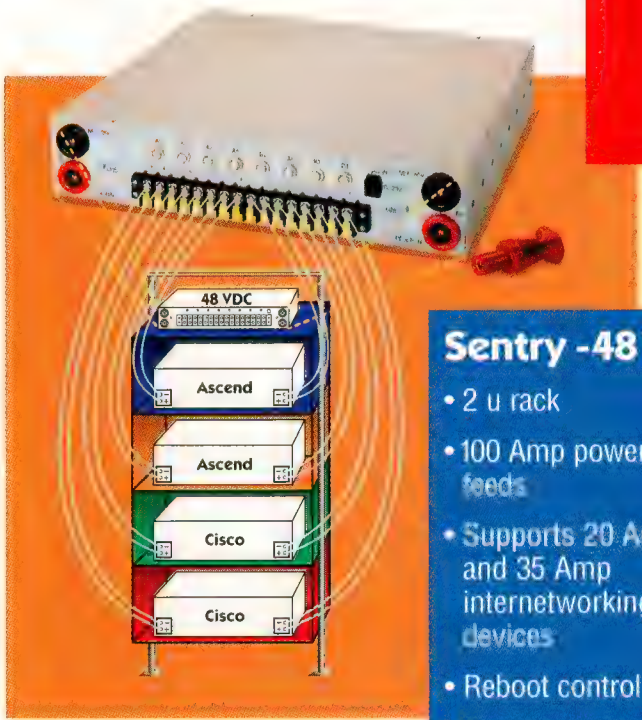

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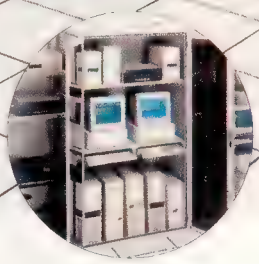

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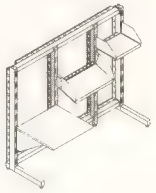

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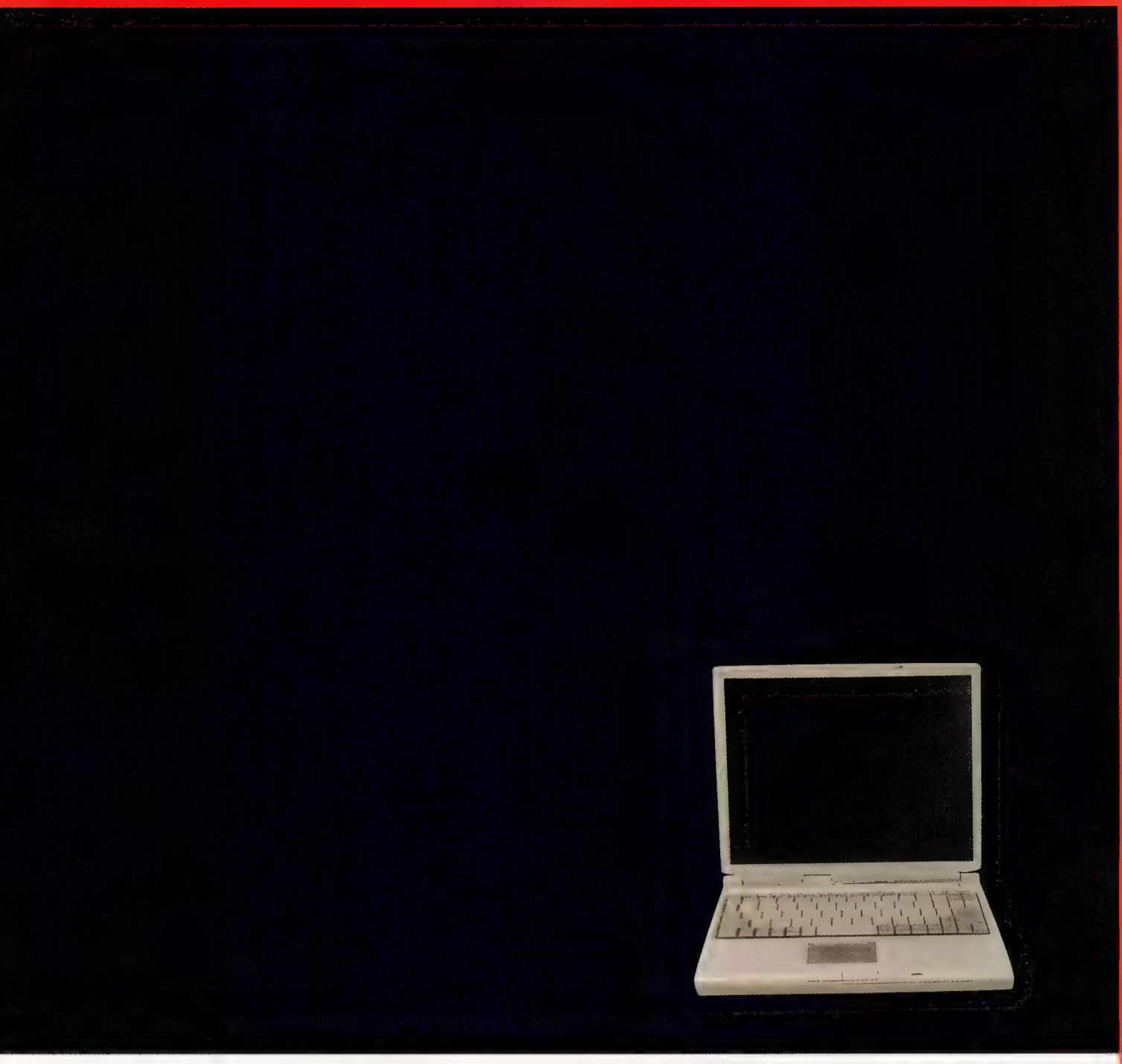

This notebook is designed to provide all the functions of a powerful desktop multimedia system in a compact, lightweight.

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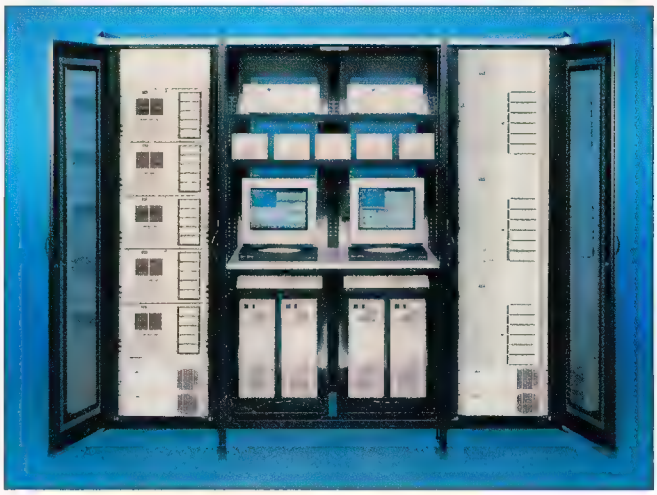

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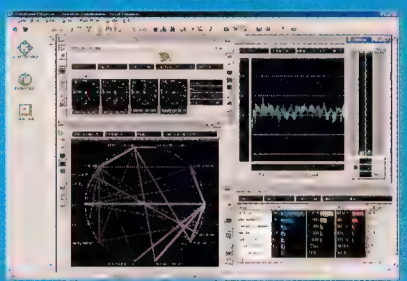

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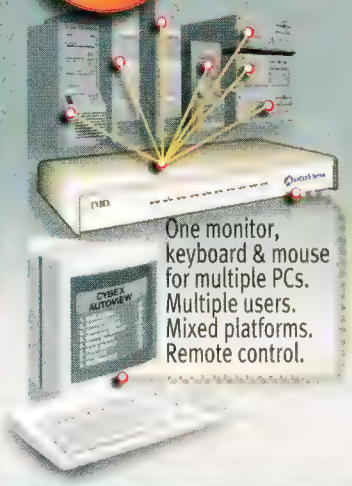

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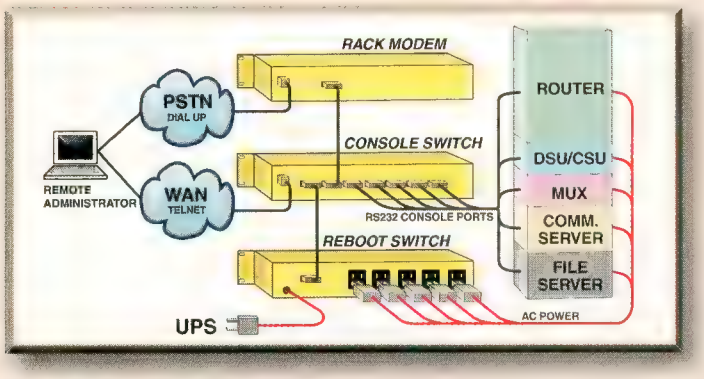

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1 I specify, recommend, approve, purchase or influence the purchase of computer hardware/software/applications used in a networked environment. (Please answer both sections)

Currently A ☐ Yes B ☐ No Planned C ☐ Yes D ☐ No

2 P) What is your PRIMARY Job Function? (Select only one)
O) What are all of your OTHER Job Functions? (Select ALL that apply)

P	O	
		Networking/IS Management
01 ○	21 ☐	Centralized IS Management (VP, Director, Chief, Head, Manager, Supervisor, Project/ Group Leader)
02 ○	22 ☐	Divisional/Departmental IS Management (VP, Director, Chief, Head, Manager, Supervisor, Project/Group Leader)
03 ○	23 ☐	Network/LAN/WAN Management (VP, Director, Chief, Head, Manager, Supervisor, Project/ Group Leader)
04 ○	24 ☐	Data/Telecommunications Management (VP, Director, Chief, Head, Manager, Supervisor, Project/Group Leader)
05 ○	25 ☐	PC/Micro Management (VP, Director, Chief, Head, Manager, Supervisor, Project/Group Leader)
06 ○	26 ☐	Internet/Intranet Management (VP, Director, Chief, Head, Manager, Supervisor, Project/ Group Leader)
		Networking/IS Staff
07 ○	27 ☐	IS Specialist (Systems Analyst/Engineer, Integrator, Application Developer, Programmer)
08 ○	28 ☐	Network/LAN/WAN Specialist (Systems Analyst/Engineer, Integrator, Application Developer, Programmer)
09 ○	29 ☐	PC/Micro Specialist (Systems Analyst/Engineer, Integrator, Application Developer, Programmer)
10 ○	30 ☐	Internet/Intranet Specialist (Systems Analyst/Engineer, Integrator, Application Developer, Webmaster)
		Corporate Management
11 ○	31 ☐	Executive Management (President, CEO, Chairman, Owner, Principal, Partner)
12 ○	32 ☐	Financial/Administrative Management (Finance, Purchasing, Administration, Human Resources, with any of the following titles: VP, Director, Chief, Head, Manager, Supervisor, Project/ Group Leader)
		Consulting
13 ○	33 ☐	Consulting
98 ○	99 ☐	**Other** _____ *(Please specify job function, not title)*

3 The primary business activity performed at this location is: (Select only one)

01 ○ Finance/Banking/Accounting
02 ○ Insurance/Real Estate/Legal
03 ○ Health/Medical/Pharmaceuticals
04 ○ Entertainment
05 ○ Construction/Engineering/Architecture
06 ○ Media/Marketing/Advertising
07 ○ Wholesaler/Distributor
08 ○ Online/Internet Service Provider
09 ○ Communications Carriers/ Telecommunications/Communication Svcs.
10 ○ Computer/Data Processing/Information Svcs.
11 ○ Utilities
12 ○ Manufacturing/Design (Other than Computer/ Communications Equip.)
13 ○ Manufacturing/Design (Computers, Software Peripherals Network Products, Communications Equip.)
14 ○ Agriculture/Forestry/Mining/ Petroleum/Chemicals
15 ○ Transportation
16 ○ Government/Public Administration/Military
17 ○ Aerospace
18 ○ Education
19 ○ Consulting
20 ○ Resellers of Computer/Communications products (VARs, VADs, Distributors)
21 ○ Systems Integrators/Network Integrators
22 ○ R&D Labs
23 ○ Non-Profit/Trade Associations
24 ○ Travel/Hospitality/Recreation/Food Svcs.
25 ○ Retailer
26 ○ Business Services (non computer)
99 ○ Other _____ *(please specify business activity)*

4 I have the following involvement in purchasing products: (Select all that apply)

A ☐ Create IT Strategy
B ☐ Determine Needs/Features
C ☐ Evaluate Brands
D ☐ Specify Brands/Vendors
E ☐ Approve Purchases
F ☐ None of the above

5 My highest level of involvement in the purchase of computing hardware/software/applications in a networked environment is for: (Select only one)

1 ○ Multinational enterprise
2 ○ Domestic enterprise
3 ○ Multiple locations
4 ○ The entire location
5 ○ Multiple departments at location
6 ○ One department
7 ○ None of the above

6 What is the annual dollar volume of computing hardware/software/services which you are currently or will be involved in purchasing: (Select ALL that Apply)

A $100 Million or over
B $25 to $99.9 Million
C $10 to $24.9 Million
D $5 to $9.9 Million
E $1 to 4.9 Million
F $500,000 to $999,999
G $100,000 to 499,999
H $25,000 to $99,999
I $10,000 to $24,999
J Under $10,000
K None

1 ☐ Networking/Comm Hardware/Software/Services
2 ☐ Internet Hardware/Software/Services
3 ☐ Intranet/Extranet Hardware/Software/Services
4 ☐ PC's/Workstations
5 ☐ Servers
6 ☐ Mini/Midrange Systems
7 ☐ Mainframe/Large Scale
8 ☐ Application Software
9 ☐ Peripherals
0 ☐ Outside Services/Consulting

7 The following computer/network operating systems/protocols/topologies are currently used or planned for use at this location: (Check all that apply)

Desktop/Workstation OS
01 ☐ DOS
02 ☐ OS/2
03 ☐ Windows 3.x
04 ☐ Windows 95
05 ☐ Windows NT
06 ☐ SCO Open Desktop/Unixware
07 ☐ Sun OS/Solaris
08 ☐ HP/UX
09 ☐ AIX
10 ☐ Open VMS/ Digital Unix
11 ☐ MAC OS
12 ☐ LINUX
13 ☐ Other Unix

Server/Midrange/ Mainframe/OS
14 ☐ Any Unix
15 ☐ NT Server
16 ☐ MVS
17 ☐ VM
18 ☐ OS/400
19 ☐ VAX/VMS

Network Operating Systems
20 ☐ NetWare 3 X
21 ☐ NetWare 4 X
22 ☐ Windows NT
23 ☐ Banyan Vines
24 ☐ OS/2
25 ☐ Unix/NFS
26 ☐ DCE

Protocols
27 ☐ TCP/IP
28 ☐ SNA
29 ☐ IPX/SPX
30 ☐ DECnet
31 ☐ OSI (X.400, X.500)
32 ☐ NetBIOS
33 ☐ SNMP
34 ☐ RMON
35 ☐ RMON 2

LAN Topologies
36 ☐ Ethernet
37 ☐ Fast Ethernet
38 ☐ Gigabit Ethernet
39 ☐ Token Ring
40 ☐ FDDI
41 ☐ ATM
42 ☐ Fibre Channel
43 ☐ Wireless

WAN Topologies
44 ☐ Frame Relay
45 ☐ ATM
46 ☐ ISDN
47 ☐ X.25
48 ☐ SONET
49 ☐ 56K
50 ☐ Switched 56K
51 ☐ xDSL (ADSL, SDSL, HDSL)
52 ☐ T - 1
53 ☐ T - 3
54 ☐ OC3

☐ 99 None of the above

8 I currently or plan to specify, recommend, approve, purchase, or influence the purchase of any of the following computer products/services used in a networked environment: (Select all that apply)

Computers
01 ☐ PC's
02 ☐ Workstations
03 ☐ Midrange computers
04 ☐ Mainframe
05 ☐ Laptops/Notebooks
06 ☐ PDA's
07 ☐ Network Computers

Servers
08 ☐ File Servers
09 ☐ Print Servers
10 ☐ Terminal Servers
11 ☐ Application Servers
12 ☐ E-Mail Servers
13 ☐ Database Servers
14 ☐ FAX Servers
15 ☐ Video Servers
16 ☐ Remote Access Servers
17 ☐ Web/Intranet Servers
18 ☐ Storage Servers

Application Software
19 ☐ CAD/CAM
20 ☐ Data Warehousing/Data Mining
21 ☐ Relational Database Mgmt.
22 ☐ Object Oriented Database Mgmt.
23 ☐ Desktop Publishing
24 ☐ Document Management
25 ☐ Electronic Commerce/EDI
26 ☐ E-mail/Messaging
27 ☐ Enterprise Resources Planning
28 ☐ Executive Information Systems
29 ☐ Groupware
30 ☐ Help Desk Software
31 ☐ Multimedia
32 ☐ Office Suites
33 ☐ Payroll
34 ☐ Statistical Analysis
35 ☐ Videoconferencing/Whiteboard

Middleware
36 ☐ Data Access/Database Middleware
37 ☐ Web to Database Middleware
38 ☐ Application Development Tools
39 ☐ CASE/4GL
40 ☐ Messaging Middleware

Network Infrastructure
41 ☐ Local Networking (LANS)
42 ☐ PC Cards/PCMCIA
43 ☐ Network Adapter Cards
44 ☐ Fast Ethernet
45 ☐ Cabling Products
46 ☐ Workgroup Hubs
47 ☐ Enterprise Hubs
48 ☐ Firewalls
49 ☐ Wireless LANs
50 ☐ Workgroup Switches
51 ☐ Campus Switches
52 ☐ Disaster Recovery
53 ☐ FRADs
54 ☐ Multiplexers
55 ☐ Frame Relay Switches
56 ☐ Layer 3 Switches
57 ☐ ATM Switches
58 ☐ Cable Modems
59 ☐ V.34 Modems
60 ☐ V.90 Modems
61 ☐ Remote Access Hardware
62 ☐ Remote Access Software
63 ☐ DSU/CSUs
64 ☐ LAN to Mainframe Links
65 ☐ Bridges
66 ☐ Routers
67 ☐ Gateways

Peripherals
68 ☐ Laser Printers
69 ☐ Terminals
70 ☐ X-Terminals
71 ☐ Printer Sharing Devices
72 ☐ Tape Back-up Hardware
73 ☐ Tape Back-up Software/HSM
74 ☐ Fax Boards
75 ☐ UPS
76 ☐ Monitors
77 ☐ Optical/CD ROM/DVD
78 ☐ RAID
79 ☐ Disks 4GB and larger
80 ☐ Jukeboxes

Network Management
01 ☐ Network Mgmt. Software
02 ☐ Systems Mgmt. Software
03 ☐ Network Test Equipment
04 ☐ Security/Encryption
05 ☐ Anti-Virus Software
06 ☐ Network Analyzers/Monitors
07 ☐ Utilities Software
08 ☐ Outsourcing
09 ☐ WAN Management Software

Wide-Area Network Products/Services
10 ☐ T-1/Fractional T-1
11 ☐ 56/64 Kbps Leased Lines
12 ☐ T-3
13 ☐ Frame Relay Services
14 ☐ ISDN
15 ☐ ATM
16 ☐ X.25
17 ☐ xDSL
18 ☐ PBX's
19 ☐ Computer Telephony Integration
20 ☐ Wireless/Cellular/PCS
21 ☐ Satellite Broadband
22 ☐ Carriers/CLECs/CAPs
23 ☐ ISPs
24 ☐ Virtual Private Networks

Internet/Intranet
25 ☐ Internet Access Suites
26 ☐ Web Applications
27 ☐ Web Site Development Tools
28 ☐ Web Browsers
29 ☐ TCP/IP Stacks
30 ☐ Intranet Servers
31 ☐ Web Servers/ Commerce Servers
32 ☐ Web Authoring Tools
33 ☐ Content Management Tools
34 ☐ Web Hosting Services
35 ☐ Proxy Servers
36 ☐ Search Engines
37 ☐ Web Site Management Software

98 ☐ Other *(please specify)* _____

99 ☐ None of the above

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Form 25 EGAP

9 The following E-Mail/Groupware/Database products are currently installed or will be installed at this location: (Check all that apply)

E-Mail/Groupware

01 ☐ cc:Mail
02 ☐ Lotus Notes/Domino
03 ☐ Microsoft Exchange/Mail
04 ☐ Novell GroupWise
05 ☐ Banyan/Beyond Mail
06 ☐ HP Open Mail
07 ☐ Oracle Mail
08 ☐ Netscape
09 ☐ Open Text

Database Engines

10 ☐ Oracle
11 ☐ Sybase SQL Server
12 ☐ OS/2 Database Manager
13 ☐ DB2
14 ☐ Informix
15 ☐ Microsoft SQL Server
16 ☐ Microsoft SNA Server
17 ☐ CA-Ingres

Web Server Software

18 ☐ Microsoft
19 ☐ Netscape
20 ☐ Open Text
21 ☐ Apache
22 ☐ Novell

Programming Languages

23 ☐ Basic
24 ☐ SQL
25 ☐ C/C++
26 ☐ Java
27 ☐ ActiveX
28 ☐ SAS
29 ☐ SAP
30 ☐ PowerBuilder
31 ☐ ObjectView
32 ☐ Oracle Developer 2000
33 ☐ Integrated Development Environments

☐ 99 None of the above

10 The approximate number of employees: (Select one in each column)

	In Entire Company	At This Location
20,000 or more	01 ○	11 ○
10,000 - 19,999	02 ○	12 ○
5,000 - 9,999	03 ○	13 ○
1,000 - 4,999	04 ○	14 ○
500 - 999	05 ○	15 ○
100 - 499	06 ○	16 ○
50 - 99	07 ○	17 ○
Under 50	08 ○	18 ○

11 The following types of networks are currently used or will be used at this location: (Check all that apply)

ENTERPRISES

I ☐ Metropolitan/Regional
J ☐ National
K ☐ International
L ☐ Internet
M ☐ Intranet
N ☐ Extranet
O ☐ Other _____ (please specify)

☐ P None of the above

12 Your feedback helps us evolve the magazine. Would you like to participate in a Network Computing Advisory Research Panel?

1 ○ Yes 2 ○ No

13 May we contact you by e-mail?

3 ○ Yes 4 ○ No

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5 ○ Yes 6 ○ No

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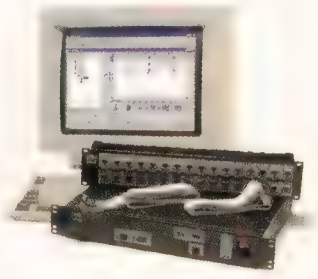

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3C905B-TX-M Single/20PK/100PK 97/1,724/7,980
3C905B-TX 10/100 PCI Single/5PK 93/411
3C905B-TX 10/100 PCI 20PK/100PK 1,628/7,501
3C980-TX 100BTX Server Card/5PK 110/515
3C597 10/100BaseT EISA/5PK 235/1,137
3C905B-FX(SC) 100BFX(SC) Fiber PCI/5PK .. 239/1,153
ADAPTEC ANA-6944A 4 PORT 10/100 581
INTEL PILA8460B Pro 10/100 PCI/5PK 79/366
PILA8460B Pro 10/100 PCI 20PK/80PK 1,322/4,799
PILA8470B Server Adaptec/5PK 107/501
PIILA8480 Pro 10/100 Intelligent Svr card/5PK . 343/1,612
PILA8485 10/100 Smart Adapter 781
PILA8472 10/100 Dual Port/5PK 259/1 239

Fast Ethernet Hubs

3COM Office Connect 4 100TX ports/8 100BTX 100/180
Office Connect TP1200 12 100TX ports 315
3COM 3C250C-TX 12 100 BASE TX Stackable Hub 771
3C250C-TX 24 100 BASE TX Stackable Hub 1,123
ASANTE AsanteFast 12-pt 100BTX 700
BAY NETWORKS BayStack 202 12 100BTX 1,111
BAYSTACK 203 12-100BTX & 1 100Base-FX 1,311
BAYSTACK 204 24-100BTX HUB 1,008
BAYSTACK 205 12-100BTX HUB 732
CISCO Fasthub 16 100BTX WS-C116T 795
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INTEL IN BUSINESS 4 100BaseTX/8 100BaseTX . 108/192
Express 140T 16 100BaseTX 659
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FE508 8 100BTX Stackable/FE516 16 100BTX .. 296/472
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3COM Office Connect 8 Port Dual Speed Hub 259
SuperStack II Hub 500 10/100 12/24 Pts 761/1,038
Baseline 10/100 12/24 Ports 796/1,162
CISCO Fasthub 112T 12 10/100 Ports 778
124T 24 10/100 Ports 1,231
D-LINK DSH-8 8 Port w/ 1 Uplink, stand alone 163
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DFE-916X 16 Port/DFE-2624X 24 Pts 636/1,013
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J3288A 12 10/100/J3289A 24 10/100 w/MGMT . * 482/796
INTEL IN BUSINESS 8 port 10/100 277
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NETGEAR Dual Speed 8-Ports DS108NA 188
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DS524 24-Port Stackable 716
SMC EZ Hub 10/100 12 Port/24Port 252/498

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3COM 3CCE589ET PC Card 10BT/COMBO 131/178
3C389 Tokenlink Velocity PC Card/5PK 271/1,337
3CCFEM556B V.90 PC CARD W/ 10/100 262
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3CXFE575BT 10/100 Card Bus w/ XJACK 20PK 2,967
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Real Port Card Bus 10/100BTX (RBE-100BTX) 150

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OfficeConnect 16 TP, 1 BNC 172
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SuperStack II PS Hub 40 12-pt/24-pt 481/848
SuperStack II PS Hub 50 24-pt 916
SuperStack II Hub 10 12pt/24-pt 506/887
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CG1001E02 BayStack 102 24-pt 1001
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EMULEX Connect Plus 2 ports/8 Ports 380/1,743
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Pipeline 130 w/FT1,T1,ISDN, Firewall/VPN 1,312
Max 800 Plus w/4 BRI Cards 2,948
CISCO 762M ISDN Rtr/766M w/ 2 Analog Ports 447/580
772 4-10BT/Cisco 776 4-10BT, 2 Analog 544/658
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1602 1 ENET, 1 56K CSU, 1 Open WAN slot 1,350
1604 1 ENET, 1 ISDN, 1 Open WAN slot 1,350
2501 2 SYNC/2503 2 SYNC,ISDN 1,828/2,244
2514 2 ENET, dual serial router 2,145
2524 1 ENET, USER CONFIG WAN PORT 1,672
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Netopia Internet Rtr TCP/IP 29-Users/Unlimited .. 632/680
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NetportExpress Pro 100 10/100BTX 1P/3Pack 224/600
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CHEYENNE FaxServe NLM 5/10/25 ..... 379/692/1,135
FaxServe NLM 50/100/250 ..... 1,752/2,504/3,758
FaxServe for WinNT 5/10/25/50 Users 254/443/882/1,376
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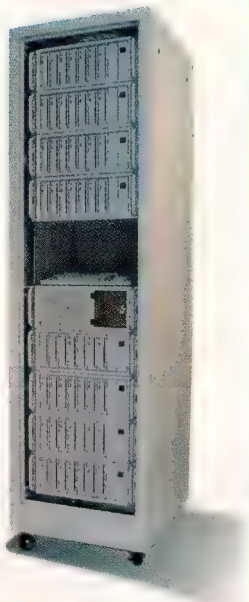

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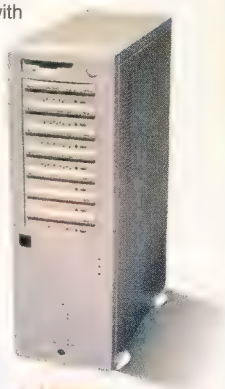

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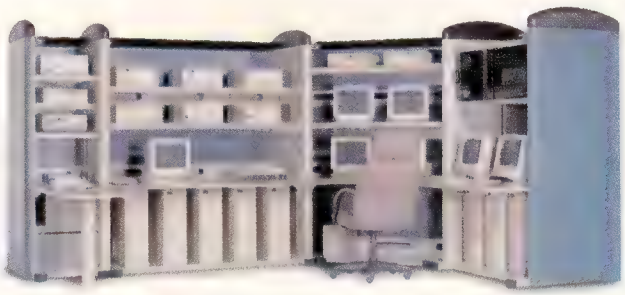

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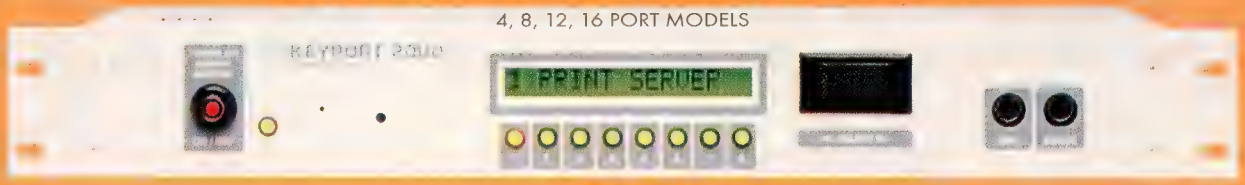

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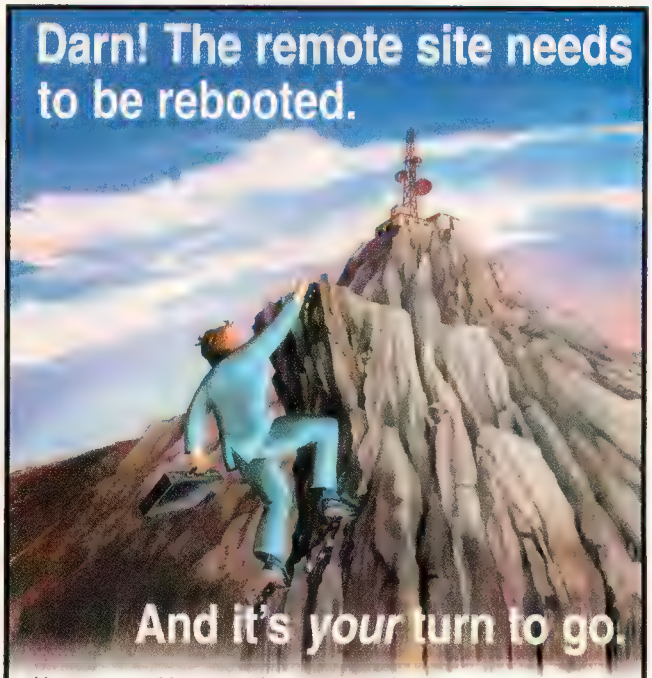

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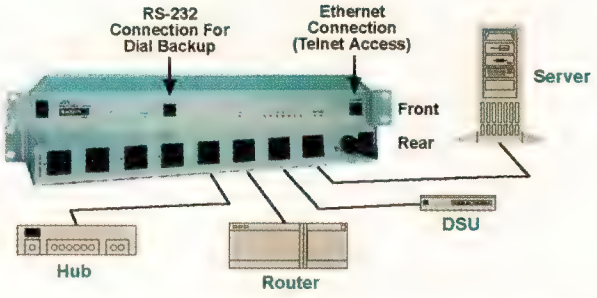

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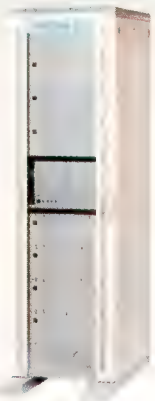

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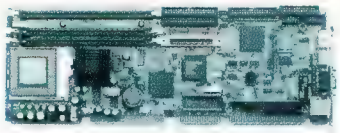

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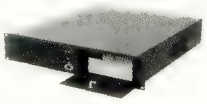

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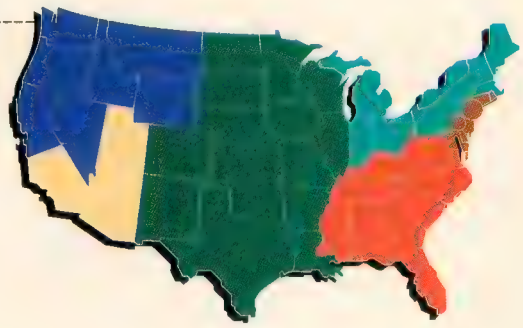

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Reading Between the Headlines

Gigabit Ethernet, Cabletron and Olicom are in the news. But are they making headlines for successes or foibles?

What do Gigabit Ethernet, Cabletron and Olicom have in common? My initial instincts tell me the answer is "nothing." But I notice that they've all been in the news lately, for interesting reasons, and I wonder if there is a line to be drawn from one to the other. They are all responding to an ever-changing market. So, let's take a quick look at each.

Gigabit Ethernet shipments are up. Way up. I don't think that's a surprise to anyone. The technology appears to be mature enough for a good portion of corporate buyers. And, as we'd expected, lots of Gigabit Ethernet sales are coming at the expense of ATM. In the 18 months that Gigabit Ethernet has been around, it's garnered 8 percent of backbone port shipments and 4 percent of server port shipments, according to Infonetics.

These numbers are pretty strong, considering most major vendors were late in getting their Gigabit Ethernet products to market. As more products appear, these numbers will climb. Many Gigabit Ethernet naysayers are complaining about the technology's fitness for deployment. Nevertheless, a number of enterprises are using this technology, especially as they push Fast Ethernet to the desktop. It's looking like the naysayers will have their comeuppance.

Wherefore Art Thou, Strategy? Cabletron made the news this week with its strategy du jour: The company plans to get into the services business. Cabletron has a professional services group that takes in about $200 million a year. It hopes to bring that up to $1 billion. But Cabletron is in a tough spot. It positions itself as a competitor of Nortel, Cisco and Lucent—which is surely a losing proposition. Each of those companies is infinitely larger than Cabletron and can easily compete on the levels of service, price and product line. Each also has a successful professional services group that supports large sales of equipment.

Entering into the services game seems unlikely to advance Cabletron's cause. First of all, Cabletron wildly overestimates the market's appreciation of Spectrum (its management software). Spectrum is a good package, but Cabletron certainly won't grow a $1 billion services business around it. The company isn't perceived favorably enough to grow a services business without a killer product line to back it up. If companies aim to purchase professional services, there are well-established consulting firms that can do the job. The idea of Cabletron becoming a serious competitor to Computer Associates or Tivoli is also a stretch.

Cabletron has always believed that it could provide a value-add that would somehow make its products seem attractive even at a premium price. The enterprise market has rarely bought into that strategy, much to the detriment of Cabletron. The company was so convinced that it needed to play in a premium-priced market that a telco guy was briefly installed as the company's CEO. Cabletron didn't make much of a dent in the carrier space and I doubt it will do any better in services. We'll await tomorrow's new strategy.

On the Road to Recovery Finally, there's Olicom. This company almost had a corporate aneurysm after the release of a column I wrote about high-speed Token Ring. Well, Olicom recently announced that it would be building products to help customers make the transition to Fast Ethernet. Damn, that's what my column was about! I actually think it's great that Olicom is jumping on the Ethernet bandwagon. And I think it's finally doing its customers a huge favor.

My only question is, where was Olicom a couple of months ago? Of course, I'd love to take credit for the company's miraculous turnaround on Ethernet, but since Olicom announced products with this latest strategy, I think it's fair to assume that this has been its game plan for some time. I suppose it wouldn't seem right for one of the founders of the Fast Token Ring Alliance to come out with a migration strategy at the same time that it came out with Fast Token Ring products.

So there you have it. Gigabit Ethernet is hot, Cabletron is adrift and Olicom sees the light. All are making headlines. And I've decided to trust my initial instincts. They have nothing in common. ■

Send your comments on this article to Art Wittmann at awittmann@nwc.com.

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In Our April 19 Issue

Feature: **The New Law of Shrink-Wrap**

A little-known provision of the Uniform Commercial Code is poised to turn your business practices on its head. UCC Article 2B would make the oft-ignored licenses of shrink-wrapped software enforceable. If it passes in your state, expect to be bound by red tape and drowned in red ink as publishers restrict transfers, shut down software at will, avoid paying damages for faulty programs and send potential litigants halfway around the world to file suit.

Review: **Web Server-Based Encryption**

The number of customers checking out your Web-based services is increasing at lightning speed. They're looking for reliable access that's fast and easy—and you must meet these expectations or risk losing their business. We tested two crytographic accelerators, and found that while these tools increase your Web server's ability to process transactions, they don't necessarily enhance the ability to accept additional network connections.

Workshop: **Migrating From IPX to IP**

Before undertaking the IPX-to-IP migration, you need to take a serious look at the applications used on the network. Are there any dependencies in some applications that require the IPX protocol? Most applications that are not NetWare-aware don't care what protocol is used on the clients, but there are a few that depend on it. Know where to tread in making the migration.

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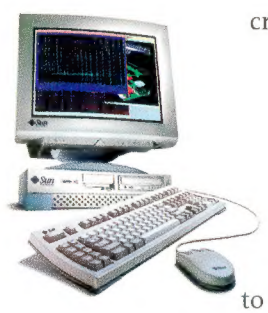

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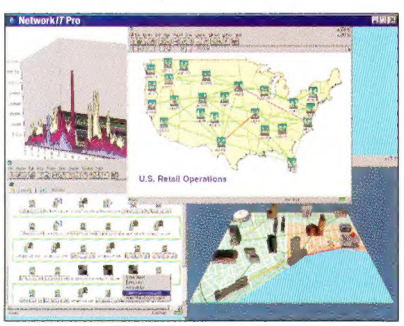

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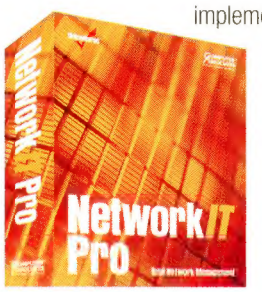

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